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The Journal of HEREDITY

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A New Pink-Fleshed Grapefruit . . T. Ralph Robinson
Causes of Shedding in Cotton . . . . . O. F. Cook
Democracy and the Human Equation . . . . .(A Review)
Designating Relationships . . . Alexander Graham Bell
A Genetic Portrait Chart . . . . David Fairchild
Heritable Characters of Maize . . . . J. H. Kempton
Bud Variation in Eleagnus . . . . . C. S. Pomeroy
Measuring Human Intelligence . . . . . (A Review)
The Second International Congress of Eugenics

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The American Genetic Association

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VOL. XII, No. 5 MAY, 1921

CONTENTS

THE BUD-SPORT ORIGIN OF A NEW PINK-FLESHED GRAPEFRUIT IN FLORIDA, by T. Ralph Robinson 195
CAUSES OF SHEDDING IN COTTON, by O. F. COOK 199
DEMOCRACY AND THE HUMAN EQUATION, A Review of Alleyne Ireland's Book, by FREDERICK ADAMS WOODS 205
AVERAGE HEIGHTS AND WEIGHTS OF CHILDREN UNDER SIX YEARS OF AGE 208
A SIMPLE SYSTEM OF DESIGNATING RELATIONSHIPS, by ALEXANDER GRAHAM BELL 210
A GENETIC PORTRAIT CHART, by DAVID FAIRCHILD 213
THE SECOND INTERNATIONAL CONGRESS OF EUGENICS 219
HERITABLE CHARACTERS OF MAIZE—White Sheaths, by J. H. KEMPTON 224
RECORDS SHOW NO RADICAL CHANGE IN SEASONS 226
BUD VARIATION IN ELEAGNUS, by C. S. POMEROY 227
MEASURING HUMAN INTELLIGENCE, A Review of H. H. Goddard's Book "Human Efficiency and Levels of Intelligence," by PAUL POPENOE 231
A LIVING DOUBLE HEADED CALF, by W. M. GOLDSMITH 237
UNCLE SAM'S MODEL VILLAGE 240

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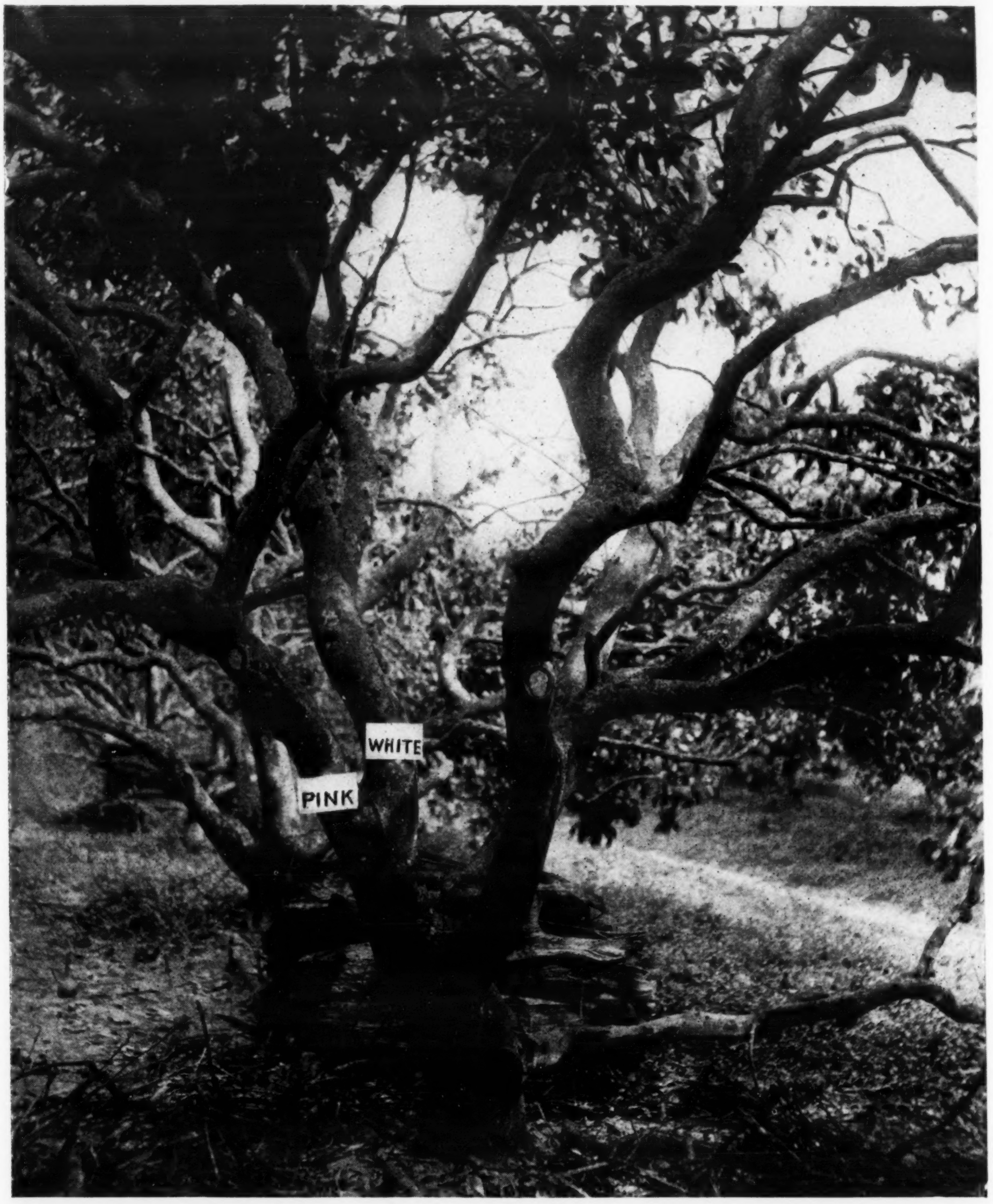


PARENT TREE OF THE FOSTER PINK-FLESH GRAPEFRUIT

This is the original tree from which the Foster pink-fleshed grapefruit was derived as a limb sport. The branch marked "pink" bears the pink-fleshed fruits while the rest of the tree bears Walters grapefruit, the ordinary variety. The tree is growing at Manavista, Florida. Its pink fruits, except for the coloring which is only in the dividing membranes, do not differ in their physical characteristics from the ordinary Walters variety, but they are found to mature earlier. (Frontispiece.)

THE BUD-SPORT ORIGIN OF A NEW PINK-FLESHED GRAPEFRUIT IN FLORIDA

T. RALPH ROBINSON
Crop Physiology and Breeding Investigations, U. S. Dept. of Agri.

THE occurrence of citrus fruits having pink flesh has been noted from time to time, occasionally under circumstances which have made it impossible to trace the fruit to the parent tree.

Mr. A. D. Shamel has recently called attention to the bud-sport origin of a pink-fleshed strain of Marsh grapefruit in California.[1] In this connection he refers to the origin of the well-known Foster variety (a pink-fleshed grapefruit) which originated as a bud sport of the Walters grapefruit in Florida.

In response to an inquiry from Mr. Shamel for photographs of Foster fruits, the writer, then in Florida, found that there was no authentic record or photograph of the parent tree of this variety. Steps were immediately taken to locate the parent tree and secure photographs. Fortunately, the limb which bears the pink-fleshed fruit was marked at the time of discovery with a letter "p" cut into the bark, so that the tree was finally and with certainty located. It stands in the Atwood Grove at Manavista, Florida.

The main portion of this tree bears Walters grapefruit, one branch only (marked "pink" in the photograph) producing pink-fleshed fruit, but not otherwise differing in its physical respects from the Walters. (See Frontispiece). The variation was first discovered by R. B. Foster of Manatee, Florida, during the season of 1906–07. Mr. Foster was at that time foreman of the Atwood Groves. Mr. E. N. Reasoner of the Royal Palm Nurseries at Oneco, Florida, became interested in this unusual fruit and since 1914 has catalogued and distributed the variety which he named the "Foster" after the discoverer. While usually described as a pink-fleshed fruit, careful examination of the cut fruit reveals the fact that the color lies solely in the membranes separating the pulp vesicles and in the lining of the rind. The pulp itself is not colored but is so transparent that the color of the "rag" shows through the pulp, making it appear pink. The rind, as mentioned by Mr. Shamel, often shows traces of pink color in uneven areas. Though apparently not otherwise differing from the Walters variety, this bud sport, the Foster, seems to mature earlier than the parent variety and it is now being catalogued and recognized as an *early-maturing grapefruit.*

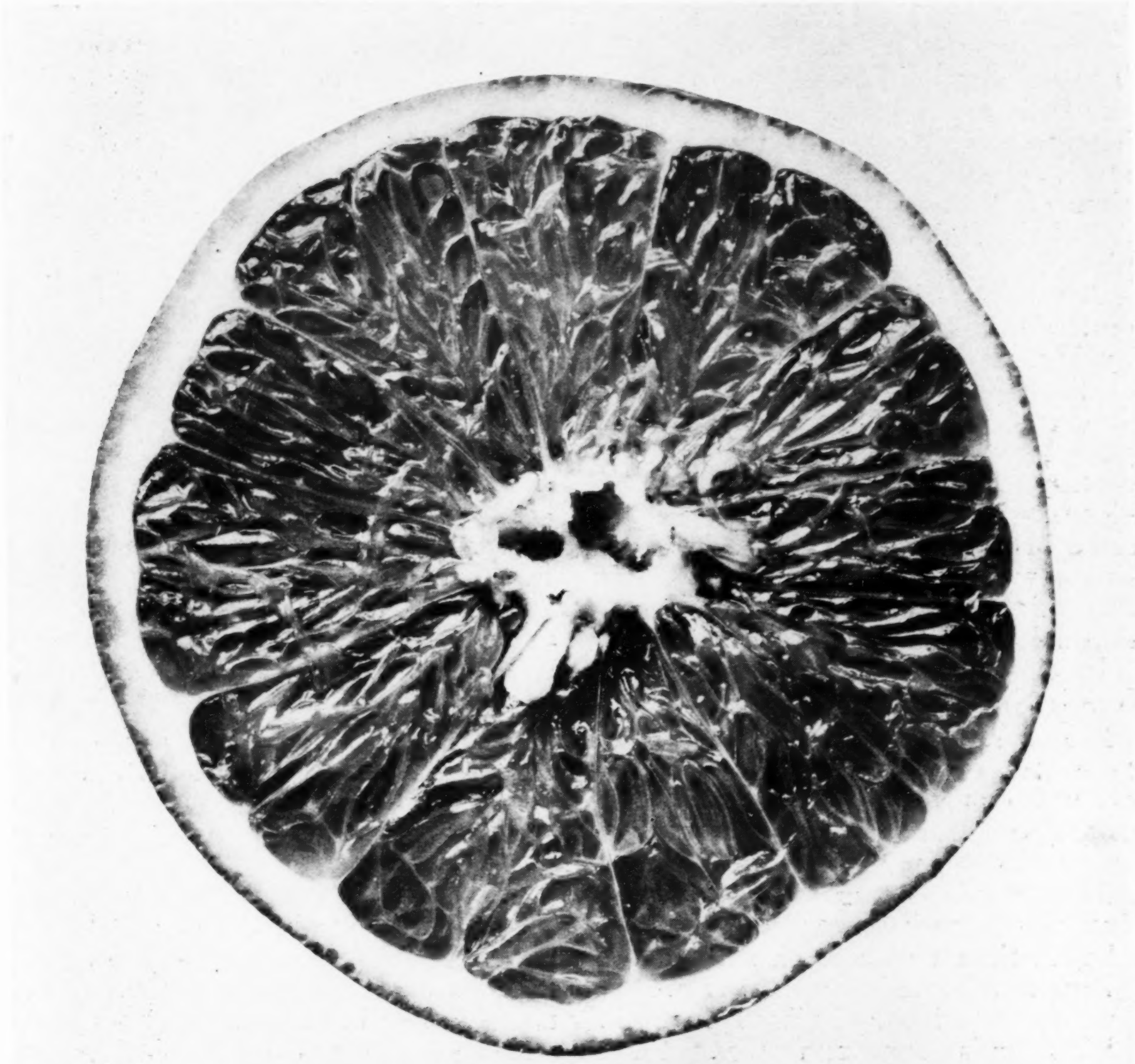
THE PINK MARSH GRAPEFRUIT

It is rather remarkable that another pink-fleshed grapefruit—the Pink Marsh—should have originated in the same section of Florida, springing, as the Foster did, as a bud sport from a well established variety, the Marsh (or Marsh seedless). Not more than five miles south of the Atwood Grove the pink Marsh was discovered in a grove belonging to W. B. Thompson, adjoining the Royal Palm Nurseries, near Oneco, Florida. Mr. S. A. Collins of Oneco, who first discovered this fruit, gave the writer an account of the finding, substantially as follows: In 1913, while looking through the grove to pick some fruit of uniform size and grade to fill a special order, he selected

[1] Shamel, A. D. Origin of a grapefruit variety having pink-fleshed fruits. JOURNAL OF HEREDITY, XI, n. 4, p. 157. Apr. 1920.

ORIGINAL TREE BEARING PINK MARSH GRAPE FRUIT

This tree stands near Oneco, Florida, and is the original one on which the pink Marsh grapefruit was discovered. It is not more than five miles from the grove containing the tree which bears the Foster pink-fleshed fruits. Two branches bearing typical Marsh fruits have been pruned off this tree so that the entire tree now produces only pink-fleshed fruits. (Fig. 1.)



A PINK-FLESHED MARSH GRAPEFRUIT

The Marsh pink grapefruit originated as a bud-sport at Oneco, Florida. In this fruit the color occurs in the pulp itself and not in the inner rind and attached membranes, while in the Foster grapefruits and in the Riverside strain of the pink Marsh, the color is only in the separating membranes and inner rind. (Fig. 2.)

a tree apparently of the Marsh seedless variety. On cutting one of the fruits he found it to be pink-fleshed and seedless. He knew at once that it must be something unusual, as he was already familiar with the other known pink grapefruits, the Tresca and the Foster. (The Tresca, an inferior sort, is generally believed to be a hybrid between the pink shaddock and the true grapefruit.)

On further investigation, Mr. Collins found that the other two branches of the tree (on the north and east) bore typical Marsh grapefruit, white-fleshed and practically seedless. Only the south branch bore the pink-fleshed fruit. Calling the attention of the owner of the grove to this unusual specimen, it was decided that the new fruit was worthy of propagation, and, in order to increase the amount of available budwood of the pink variety, the north and east branches (bearing typical Marsh fruits) were pruned off. The one branch remaining was the

largest of the three, and since then has grown practically erect. (See Fig. 1.) The scars are still plainly visible where the other branches were removed. The tree is budded on rough lemon stock as root sprouts (removed at the time of photographing) clearly show. All of the fruits borne by this tree are pink-fleshed.

A number of old orange trees (109) grafted over to this new variety in 1914 by Mr. Collins, bore the second year (1916) a few fruits showing the pink flesh and other characteristics of the parent tree. The freeze of 1917 destroyed these grafts when in full bloom. Mr. Reasoner, however, has some budded trees of the pink Marsh which were bearing this season, and the fruit was in every way similar to that secured from the parent tree.

In the pink Marsh grapefruit the flesh itself is pink, a character in which it differs from the Foster and from the pink strain of the Marsh described by Mr. Shamel as occurring at Riverside, California. The color of the flesh in midseason (January and February) is a beautiful pink, but later the color fades decidedly, in late March and April being a shade of amber rather than pink. A cross section of this fruit is shown in Fig. 2.[2]

There is considerable evidence in the case of the pink Marsh (as with the Foster) that the mutative influences which result in pigmentation also bring about early maturity of the fruit.

Crosses have been made by the writer between these two pink varieties in the hope of intensifying and making more permanent the color of the flesh while preserving the desirable size, shape, texture and seedless character of the pink Marsh.

[2] A preliminary examination of a preserved specimen by Dr. Lon A. Hawkins indicates that the coloring matter present is probably not anthocyanin, usually lacking in Citrus fruits, though said to occur in blood oranges.

The Genetics of Plant Life

HEREDITY AND EVOLUTION IN PLANTS by C. Stuart Gager, director of the Brooklyn Botanic Garden. Pp. 265, with 113 illus. Philadelphia, P. Blakiston's son and Co., 1920.

This convenient book is made up principally of chapters reprinted from the author's *Fundamentals of Botany*. The book begins in the classical way, with the life history of a fern, goes through experimental evolution, takes up the historical phases, and then deals with the evolution of plants from a broad point of view. The strictly genetic sections seem to be hardly up to date. Many of the illustrations are particularly good. P. P.

The New Psychology

PSYCHOPATHOLOGY, by Edward J. Kempf, M.D. Pp. 762 with 87 illus., price $9.50. St. Louis, the C. V. Mosby Co., 1920.

In this work, which is intended for the profession rather than for the general reader, Dr. Kempf has put forward a mechanistic explanation of mental processes, which while not perfect ought to be of considerable use. He manifests not only indifference but hostility to the idea that may be an important factor in the causation of mental deviations. Of eugenic interest is his strong condemnation of the American practice of placing the education of youth mainly in the hands of celibates. The volume consists largely of case-histories, with comments by the author, but an extended introduction and conclusion give a clear and well-organized outline of Dr. Kempf's somewhat extreme point of view on the problems of abnormal psychology. P. P.

CAUSES OF SHEDDING IN COTTON

Genetic factors indicated, as well as Structural and Environmental causes

O. F. Cook
Bureau of Plant Industry, U. S. Department of Agriculture

IN VIEW of the recent publication of Professor Lloyd's long-expected contribution,[1] and the interest that is likely to be aroused by so extensive a treatment of the subject, attention may be called to additional facts that may affect some of the conclusions.

Shedding is one of the special terms of cotton culture, referring to a fact of great agricultural importance, that many floral buds and young bolls are blasted and fall off, even when there are no direct injuries by boll weevils or other pests or diseases. Some writers treat shedding itself as a disease, while others consider it a normal habit of the plant to reject superfluous buds or young fruits that could not be brought to maturity. The widely divergent opinions show the need of more information.

Shedding is a consequence of abortion, and the danger of excessive abortion is to be recognized in the breeding of varieties, as well as in the improvement of cultural methods. The diversity and complexity of the environmental factors of shedding are well shown in Lloyd's paper, although the experimental work was limited to a few seasons and to eastern Upland varieties. Shedding of the floral buds, or "squares," is treated, as well as shedding of young bolls.

WHERE PEDICELS LET GO

Two questions may be asked about causes of shedding: why the buds and the young bolls abort, and how they are released from the plant. Any injury to the buds or young bolls, or any external condition that inhibits their development may be a cause of shedding. No doubt the primary causes, those that determine whether abortion is to take place, are genetic and physiological, but the method of shedding has a morphological aspect that needs to be considered, in the interest of a clear understanding of the behavior of different varieties.

The normal method of shedding is by disarticulation, that is, by unjointing of the socket where the base of the pedicel is inserted on the fruiting branch. Lloyd's studies show the lack of a structurally specialized abscission layer, and that shedding may result from merely indeterminate divisions and disintegrations of cells, often limited to one or two layers, but this does not justify the general statement, that "the position of the abscission layer is not predetermined by any anatomical relations, but is an expression of a purely physiological phenomenon." On the contrary, it appears that abscission has a very definite morphological position, occurring always at the same place, in the socket or insertion of the pedicel, which is bordered and bounded by the stipular rim.[2]

Considering that pedicels represent internodes, the sockets are the articulations or nodal points, where unspecialized, embryonic tissues would be expected. The articulation is marked

[1] Lloyd, F. E., "Environmental Changes and their Effect upon Boll-Shedding in Cotton (*Gossypium herbaceum*)." New York Acad. Sci. 29:1–131, 1920. Since the observations relate entirely to American Upland varieties, the name *herbaceum* is not applicable. It belongs to cottons of the Asiatic type, which are not cultivated in the United States. The American Upland cottons are referable to *Gossypium hirsutum*, although some writers place the Texas Big-Boll varieties under *Gossypium mexicanum*.

[2] See Morphology of Cotton Branches, Circular 109, Bureau of Plant Industry, Jan. 4, 1913, p. 13, and Brachysm, A Hereditary Deformity of Cotton and Other Plants, Journ. Agric. Research, 3:394, Feb. 15, 1915. On page 13, line 11, of Lloyd's paper the word "internode" probably should read "pedicel," though the meaning would still be doubtful, since there is no reason to suppose that abscission takes place above the base of the pedicel.

BLASTED BUD OF UPLAND COTTON

Showing abnormal attachment. This is a short fruiting branch with floral bud blasted, but still attached by abnormal decurrent base of pedicel. Slightly enlarged. (Fig. 3.)

on the surface by a minute groove and by absence of oil-glands from a short ring of nodal tissue. Even with the abnormal decurrent pedicel-bases of the "cluster" cottons, abscission still follows the line of the socket, along the stipular rim. (See Figures 3 and 4.) The tearing apart of stipules, as described and figured by Lloyd in a brachytic variety, is itself an evidence of the elongation of the socket. Though brachysm is much less frequent in the Egyptian type of cotton than among Upland varieties, there is a more distinct inequality of the stipules on the fruiting branches, the stipule that is next to the floral but being broader than the other, as though to provide for the enlargement of the socket. (See Figures 5 and 6.) Brachysm has been interpreted as a breaking down or failure of the normal differentiation between the fruiting branch internodes and the pedicel interondes. Not only are many of the joints imperfect where the pedicels are inserted on the internodes, but the leaves and bracts of the abnormal internodes and pedicels show abnormal, intermediate forms, the leaves more bract-like and the bracts more leaf-like than on normal plants.

RELATION TO GROWTH OF PLANTS

With sockets of the normal, circular or transversely elliptical form the pedicels often begin to tear loose at the base while the buds and their enclosing involucres are still fresh and turgid. The buds may wilt after being partially detached, or may fall with scarcely any wilting. That the sockets are too large for the pedicel-bases becomes apparent under a hand-lens, since a gap is formed at once between the separating tissues of the pedicel and the socket, indicating a release of tension. This was noted at San Antonio, Texas, under date of July 21, 1913, and the observation has been repeated on several occasions. In such cases enlargement of the sockets, rather than shrinkage of the pedicels, would seem to be the "mechanical stimulus" of sheddi5g. Lloyd's studies of young bolls showed retarded growth-rates, and led him to the conclusion that "cessation of growth is one of the phenomena of abscission," though without recognizing the morphological relations.

Checking the growth of the floral buds or young bolls while the vegetative framework of the plant is developing rapidly would explain why the sockets may become too large for the pedicels. The growth of the fruiting-branch internodes must continue, of course, in order to support more internodes, buds and

BLASTED BUDS OF UPLAND COTTON

This condition is not a disease but is due to hereditary malformation of pedicels. The buds remain attached to the plant, a condition which is sometimes mistaken for a disease. Instead of shedding promptly and leaving a small rounded socket, like that shown in Figure 3, these abnormal pedicels run down upon the joints of the fruiting branches so that normal shedding does not take place. (Fig. 4.)

ABNORMAL VARIATION OF EGYPTIAN COTTON

Short-jointed, but with normally formed pedicel and small, rounded scar left by a bud which had been shed, to contrast with elongated sockets and failure of normal shedding in Upland "cluster" varieties. Note that the stipules have fallen from the bases of the two lower leaves, but are present on the others, and of unequal size. The second involucre is imperfect, consisting of a single bract, with the bud aborted, which frequently occurs in abnormal variations. Photograph natural size. (Fig. 5.)

NORMAL EGYPTIAN COTTON

Two joints of a normal fruiting branch of Egyptian cotton showing involucre, pedicel and attachment of floral bud, with unequal stipules connected by a stipular rim, enclosing the socket. A short section of the main stalk is shown, with equal stipules and a short axillary branch bearing a single floral bud; subtended by an abortive leaf, with only the stipules developed. The lower joint of the normal fruiting branch, cut near the middle, is more than twice as long as the second joint. Natural size. (Fig. 6.)

bolls, further out on the branch. Shedding of buds is much less frequent with Egyptian cotton than with Upland varieties, but in extreme cases even the young fruiting branches of Egyptian cotton may abort, if the plants are forced into rank growth. That an over-luxuriant condition of the plants may be responsible for shedding was indicated several years ago in a paper that Lloyd seems to have overlooked.[3]

GENETIC DIFFERENCES IN SHEDDING

These facts may be recognized without prejudice to other causes of shedding that Lloyd and earlier writers have advanced, including mechanical injury, pests, diseases, drought, rain, high-temperatures, and "root-asphyxiation," by water-logging of the soil in wet weather or in irrigated regions. Lloyd finds that shedding from mechanical injury is more prompt and regular than from weevil attack. Injured buds fell off most frequently on the second day, while weevil-infested buds had a maximum of shedding on the eighth day. Lloyd advances a theory of "competition between bolls for water" to account for excessive shedding in brachytic varieties, but a genetic factor is plainly indicated in plants that abort all of their buds, while their neighbors mature good crops. Egyptian cotton may retain nearly all of its buds and young bolls while Upland varieties in adjacent rows are shedding nearly all of their buds. Sterile hybrids and sports, including the so-called "bull-stalks" of Sea Island cotton, as well as unacclimatized or abnormally overgrown plants, may produce small flower-buds in great numbers, but shed all of them at an early stage, or a few bolls may be set late in the season on secondary stalks after complete abortion on the primary stalk.

In addition to determining the periods and rates of shedding of squares and young bolls under different conditions, Lloyd finds that "abscission is inhibited during anthesis," meaning that open blossoms do not shed, and that rain destroys pollen and prevents fertilization. To this may be added that in cool, moist weather the anthers sometimes fail to open, so that no pollen is available. Complete failure to set any bolls was observed in 1905 in an experimental planting of cotton in the Senahu district of Eastern Guatemala at an altitude of 2,600 feet, under conditions of continuously high humidity, with moderate, equable temperatures. Although the plants grew to normal size and produced many flowers, the anthers remained closed and the stigmas received no pollen.

[3] See "The Abortion of Fruiting Branches in Cotton," U. S. Dept. of Agriculture, Bureau Plant Industry Circ. 118, March 22, 1913.

The Struggle of Races

THE RISING TIDE OF COLOR, by Lothrop Stoddard, A. M., Ph. D., with an introduction by Madison Grant. Pp. 320, with 3 maps. New York, Charles Scriber's sons, 1920.

In a vivid journalistic style, Dr. Stoddard has written an account of world politics that deserves and will probably get wide reading. He pictures the present world-wide dominion of the white race, which controls nine-tenths of the globe, though it comprises only a third of the inhabitants. Ready to shake off the yoke are three colored worlds. The yellow world of Western Asia is the greatest immediate menace, he believes, and he thinks that the whites should respect its position and gradually withdraw from that part of Asia. The brown world, made up principally of Islam and the Hindus, also seems to him to be due for independence, in the not distant future. In the black world of Africa, and the red world peopled by the autochtones of the Americas, he sees little hope for progress, and concludes that the whites must control these two groups, if only to keep the yellows or browns from conquering them and turning them against the whites. The conclusion of the book, is a plea for eugenics and an understanding of the biological principles underlying the organization of society. P. P.

DEMOCRACY AND THE HUMAN EQUATION

A Review of Alleyne Ireland's New Book[1]

FREDERICK ADAMS WOODS

TWO years or more ago, the JOURNAL OF HEREDITY contained some stirring communications of a provocative sort, and in a field out-side its customary limits. These were brought to press through an article entitled "Democracy and the Accepted Facts of Heredity" by Alleyne Ireland published in December 1918.

The main issue in this debate was whether the theory of extreme democracy, so much exploited since the outbreak of the Great War, could find justification in the work of modern students of biology. Mr. Ireland contended that if the biologists are right in denying the inheritance of traits accumulated through slow action of the environment, and if the students of human heredity are right in claiming the preponderating importance of germ-plasm, then the theory of democracy had some ugly facts to face.

This point of view has scarcely been recognized by any writers on the theory of government. The biologists have gone steadily along, in the last twenty years, since the rediscovery of Mendel's Laws, acquiring more and more proof of the clean-cut control of the chromosomes. The psychologists have piled up convincing evidence of mental and moral heredity, and have found in their mental-age tests (army, mental-tests, etc) undeniable evidence of the fundamental inequalities in human beings, and yet, those who should profit by this work, or at least discuss its significance, have apparently been ignorant of its existence.

Mr. Ireland is a specialist in Government. He has spent his life investigating and studying systems of government in various parts of the world. He has been a correspondent of The London Times, in the Far East; and has published several weighty books on colonial government, including "The Province of Burma," "The Far Eastern Tropics," and "Colonial Administration." He was at one time on the Editorial staff of the New York World, has lived much in America as well as in England, his native land, and so is, at least by nurture fitted for the comparative point of view.

Whether he is right or wrong in this brilliant, and perhaps hypercritical book on present day tendencies in the United States, it is certainly noteworthy that a man of this sort should show an interest in the technical aspects of heredity, and seek to apply them in his own domain.

The controversy held in the JOURNAL OF HEREDITY has now blossomed forth as a book, in which two chapters are devoted to biological relationships, and this section of the work is likely to be of chief interest to the majority of our readers.

Here the author does not follow the usual method of sociologists and political writers, and merely discuss in terms of vague statements and unsupported generalizations (deductive method which ought to be considered out-of-date) but actually appeals to the results of researches.

Almost all of these are now summarized in Popenoe and Johnson's "Applied Eugenics" and Mr. Ireland has made an eager incursion into this modern storehouse. He refers especially to Galton's "Oxford and Cambridge Graduates," Wood's "Heredity and the Hall of Fame" and "Heredity in Royalty," Thorndike's "Twins in New York City." Pearsons, Barring-

[1] Democracy and the Human Equation, by Alleyne Ireland, F. R. G. S., pp. 251. New York, E. P. Dutton & Co. 1921.

ton, Elderton and Heron of Environment, Defective Physique, Eyesight, etc. He quotes from Wood's "Laws of Diminishing Environmental Influence" to show that only in the lower forms of animal life, is much to be expected from environmental pressure.

In taking up the other side of the question and giving consideration to the advocates of environment Mr. Ireland does not quote the work of any recent investigator except that of Mr. C. L. Redfield. This is for the very good reason that, broadly speaking, there are not any others to quote. Larnark (1744-1829) was a great environmentalist and he quotes him. Herbert Spencer was a great environmentalist. He might have quoted him. Odin so much advertised by the late Lester Ward might also have been discussed, though Odin had no method of weighing heredity against environment.

The point of interest is merely this, that the preponderating force of heredity (germ-plasm control) has so slowly and generally become accepted as not to be realized among biologists, until some non-biological specialist enters the field and says: here, what does all this mean to our theories of political control?

IMPORTANCE OF LEADERSHIP

Men are far from equal in natural ability and capacity for achievement. The amount of variation is not known, though some facts suggest that it is probably very great, at least in the higher races. The doctrine of heredity ties up naturally with the more aristocratic belief in the importance of the upper classes and of exceptionally great leaders who, as many investigators have proved, do actually arise in the upper classes in far greater proportion.

As to the importance of greatness in the individual the author says p. 128: "The question resolves itself actually into the choice between a qualitative and a quantitative theory of causation in human achievement. To whatever phase of human development we turn, history fails to furnish a single instance in which an accomplished step can be referred, ultimately, to any cause other than the quality of greatness in the individual. It is this quality which has given the world all that has ennobled man's character, elevated his culture, and extended his mastery over the material elements of life. It is to the genius of a few hundred individuals among the thousands of millions who have lived that we owe all the inspiration of religion, of philosophy, of music, of art, of literature; all the benefactions of science, of discovery, of invention."

While this statement is doubtless, in a way, true, it will seem to many to be an over-statement of the case. It is true that most movements if traced to their source may be referred ultimately to the inspiration and energy of some one genius, or group of great souls, but the subsequent development appear to a great extent to depend on the qualities of the followers, their numerical total, and the opportunities of the epoch.

For instance, one of the greatest of events in the world's history took place when one half of the world discovered the other half, and explored and conquered it. There are a few great names that stand out heroically in the vast records of exploration. Perhaps the figure of Columbus is over-enlarged. It is true, that at the source we find our single and isolated initiator, Henry the Navigator, Prince of Portugal. But how small are most of the individuals compared with the vast importance of their united work.

The same may be said of the upbuilding of the United States.

Indeed the history of pure science shows, not only the greatness of the great pioneers, but that something more than they are necessary. Roger Bacon was a great innovator, but here, things stopped. In the realm of invention, there is probably even more increment, than in pure science, from the many minds who each contribute their mite.

It is not that the reviewer is unwilling to accept the "great-man theory" of history, but he realizes that there are two sides to this question. Researches which some day will enable us to weight these important historical matters have as yet scarcely been more than started.

THE LONG ARM OF GOVERNMENT

The greater portion of Mr. Ireland's book is concerned with the technical aspects of government. He suggests and develops some interesting points of view. He pokes fun at the "rapsodists" as he calls them,—Fourth of July orators, in Congress and out, with their absurdly untrue phrases, about "liberty," "equality," and "natural rights."

If the State must continuously be referred to as a "Ship of State" then it needs a self reliant Captain and a trained crew. On the ship of commerce the Captain does not drift aimlessly towards an indefinite port or take a vote of his crew, during the oncoming storm, as to the management of the ship.

Governments, today, are much more concerned than formerly in everything touching our daily routine, and therefore there is all the more need for expert knowledge. How true this is, the author has picturesquely brought out in the following paragraph, p. 95.

"What is the scope of Government today? I get up in the morning and go into my bathroom: the Department of Justice has been much interested in the Bath Tub Trust. I turn on the water: the Bureau of Public Franchises and the Bureau of Bacteriology rise before me. I grasp my tablet of soap: it is made in Chicago by the Beef Trust, the Department of Justice has to know whether it is the product of an agreement in restraint of trade, and whether the manufacturer secured a rebate from the railroad which transported it. I dry my self with a cotton towel: The Department of Agriculture has helped to afford me this convenience by furnishing the cotton-growers with a report of the bool-weevil. I step out onto my bath mat: it is an important product—was the consular invoice correct, was the full amount of duty paid on it by the New York customs broker? Presently I find myself in the kitchen, and I light my gas stove—the gas is the concern of the Government I put a lamb chop on the broiler, and as it cooks I speculate as to whether the purple stamp of the Government meat-inspector contains any poison. Presently I take a street-car to my place of business: the street-car itself, the power by which it is propelled, the track along which it runs, the stopping-places along the route, are all affected by Government regulations. I enter my office building: the structure is the concern of the Government, on account of the fire laws; the business I do in it is the concern of the Government in a dozen particulars dealt with by the Income Tax Law, The Interstate Commerce Law, the Sherman Act, the Pure Food Law, and so on. Whilst I am reading my mail the telephone bell rings—the telephone is the concern of the Government—some one tells me that my child—the child is the concern of the Government—at the public school—the school is the concern of the Government—has got the diphtheria—the diphtheria is the concern of the Government—I hasten off to pick up my physician—the physician is the concern of the Government—we go to the school in his automobile—the automobile is the concern of the Government—later on I pay him with a National Bank bill—the National Bank is the concern of the Government; and all this is no more than a sketchy outline of what Government is concerned with today."

Another novel point of view is Mr. Ireland's extended analysis between Representative Government and Delegated Government, but space does not permit its discussion here.

The whole tenor of Mr. Ireland's book is a calling out for better government,—a rule of the best, a recognition of the truths of human nature,

and a scienc of government comparable to the sciences of nature that have already done so much for man's advance. Probably the chief criticism that will be brought against this book will be from those who do not believe that present democratic governments are quite as bad as Mr. Ireland paints them. Perhaps they are not, but at least they might be better. And they will become better if they face the facts of science and if those who control them make every possible use of all the humanistic sciences that are making so much progress at the present time. For this reason, "Democracy and the Human Equation" is a distinct contribution towards a better state of things, towards that eugenic ideal, when the best shall survive, and the best shall govern.

AVERAGE HEIGHTS AND WEIGHTS OF CHILDREN UNDER SIX YEARS OF AGE

During Children's Year, the second year of the participation of the United States in the World War, the Childen's Bureau conducted a series of campaigns designed to focus public attention upon the welfare of children. Among these campaigns was the "weighing and measuring test." During the period devoted to this test great numbers of children for the most part under 6 years of age—in all parts of the United States, were weighed and measured. Record blanks were furnished by the bureau, and when the children were brought for examination entries were made of height, weight, age, sex, and race, besides particulars of country of birth of father and mother, and physical condition of the child.

As a result of this campaign the bureau received over 2,000,000 records, and was thus in possession of a larger mass of anthropometric material relating to children of these ages than was ever before available. Consultations were held with anthropologists, statisticians, and pediatrists, and plans of tabulation were prepared in accordance with recommendations made by the authorities consulted.

A careful selection was made of approximately one-twelfth of the cards which had been received. The basis of selection was fourfold: (1) The record card must have been signed by a physician; (2) no serious defects should have been noted; (3) the child must have been weighed and measured without clothing; as verified by the physician signing the card; and (4) all essential items must have been answered.

On the basis of these selected records, tables have been made showing average weights and heights for children of different ages and average weights for children of different heights. They are based upon measurements of 167,024 white children.

The children included in the tabulation were 70 per cent of native parentage; 6 per cent with one parent native and one foreign born; 4 per cent of British and Irish parentage; and the remainder of Scandinavian, Italian, and other racial stocks. They represent children from every part of the country. The averages for white children of native parentage agree very closely with these averages for all white children.

The table shows average heights and weights of boys and girls from birth to 72 months of age.

These averages represent, so far as the original material permits, averages based upon children without defects or diseases.

TABLE I.—*Height and Weight of White Children From Birth to 6 Years of Age.*[1]

Age	White boys		White girls	
	Height (inches)	Weight (pounds)[2]	Height (inches)	Weight (pounds)[2]
Under 1 month	21 1/8	9 1/8	20 7/8	8 5/8
1 month, under 2	22 1/2	10 7/8	21 7/8	10 1/8
2 months, under 3	23 5/8	12 5/8	23 1/8	11 3/4
3 months, under 4	24 1/2	14 1/8	24	13
4 months, under 5	25 3/8	15 3/8	24 7/8	14 1/4
5 months, under 6	26 1/8	16 1/4	25 1/2	15 3/8
6 months, under 7	26 3/4	17 1/2	26 1/8	16 1/4
7 months, under 8	27 1/4	18 1/4	26 3/4	17 1/8
8 months, under 9	27 3/4	19	27 1/4	17 3/4
9 months, under 10	28 1/4	19 5/8	27 5/8	18 1/2
10 months, under 11	28 5/8	20 1/4	28 1/8	19
11 months, under 12	29	20 3/4	28 1/2	19 1/2
12 months, under 13	29 1/2	21 3/8	28 7/8	20
13 months, under 14	29 7/8	21 7/8	29 1/4	20 1/2
14 months, under 15	30 1/4	22 1/4	29 3/4	21
15 months, under 16	30 5/8	22 3/4	30 1/8	21 3/8
16 months, under 17	31	23 1/4	30 1/2	21 7/8
17 months, under 18	31 3/8	23 3/4	30 7/8	22 3/8
18 months, under 19	31 3/4	24 1/8	31 1/4	22 3/4
19 months, under 20	32 1/8	24 5/8	31 5/8	23 1/4
20 months, under 21	32 1/2	25	31 7/8	23 5/8
21 months, under 22	32 3/4	25 1/2	32 1/4	24 1/8
22 months, under 23	33	25 7/8	32 1/2	24 1/2
23 months, under 24	33 3/8	26 1/4	32 3/4	24 3/4
24 months, under 25	33 5/8	26 5/8	33 1/8	25 1/8
25 months, under 26	33 7/8	27	33 3/8	25 1/2
26 months, under 27	34 1/8	27 1/4	33 5/8	25 7/8
27 months, under 28	34 3/8	27 5/8	34	26 1/4
28 months, under 29	34 3/4	28	34 1/4	26 3/4
29 months, under 30	35	28 1/2	34 1/2	27 1/8
30 months, under 31	35 1/4	28 7/8	34 7/8	27 1/2
31 months, under 32	35 1/2	29 1/4	35 1/8	27 7/8
32 months, under 33	35 3/4	29 1/2	35 3/8	28 1/4
33 months, under 34	36	29 7/8	35 5/8	28 1/2
34 months, under 35	36 1/4	30 1/8	35 3/4	28 7/8
35 months, under 36	36 1/2	30 1/2	36	29 1/4
36 months, under 37	36 5/8	30 3/4	36 1/4	29 1/2
37 months, under 38	36 7/8	31	36 1/2	29 7/8
38 months, under 39	37 1/8	31 3/8	36 3/4	30 1/8
39 months, under 40	37 3/8	31 3/4	37	30 1/2
40 months, under 41	37 5/8	32	37 1/4	30 7/8
41 months, under 42	37 7/8	32 3/8	37 1/2	31 1/8
42 months, under 43	38 1/8	32 3/4	37 3/4	31 1/2
43 months, under 44	38 1/4	33 1/8	38	31 3/4
44 months, under 45	38 1/2	33 1/2	38 1/8	32 1/8
45 months, under 46	38 3/4	33 3/4	38 3/8	32 3/8
46 months, under 47	39	34	38 1/2	32 5/8
47 months, under 48	39 1/8	34 1/4	38 3/4	32 7/8
48 months, under 49	39 1/4	34 1/2	38 7/8	33 1/8
49 months, under 50	39 1/2	34 3/4	39 1/8	33 1/2
50 months, under 51	39 5/8	35	39 1/4	33 3/4
51 months, under 52	39 7/8	35 1/4	39 1/2	34
52 months, under 53	40	35 1/2	39 3/4	34 3/8
53 months, under 54	40 1/4	35 7/8	40	34 5/8
54 months, under 55	40 1/2	36 1/8	40 1/4	35
55 months, under 56	40 5/8	36 1/2	40 3/8	35 3/8
56 months, under 57	40 7/8	36 3/4	40 5/8	35 5/8
57 months, under 58	41 1/8	37 1/8	40 7/8	36
58 months, under 59	41 1/4	37 1/2	41	36 1/4
59 months, under 60	41 1/2	37 3/4	41 1/4	36 1/2
60 months, under 61	41 5/8	38 1/8	41 3/8	36 7/8
61 months, under 62	41 3/4	38 3/8	41 5/8	37 1/8
62 months, under 63	42	38 5/8	41 3/4	37 3/8
63 months, under 64	42 1/8	39	41 7/8	37 3/4
64 months, under 65	42 3/8	39 1/4	42 1/8	38
65 months, under 66	42 1/2	39 1/2	42 1/4	38 1/4
66 months, under 67	42 3/4	39 7/8	42 3/8	38 5/8
67 months, under 68	43	40 1/4	42 5/8	39
68 months, under 69	43 1/8	40 5/8	42 7/8	39 3/8
69 months, under 70	43 3/8	40 3/4	43 1/8	39 3/4
70 months, under 71	43 1/2	41 1/4	43 1/2	40 3/8
71 months, under 72	43 7/8	41 5/8	43 5/8	40 1/2

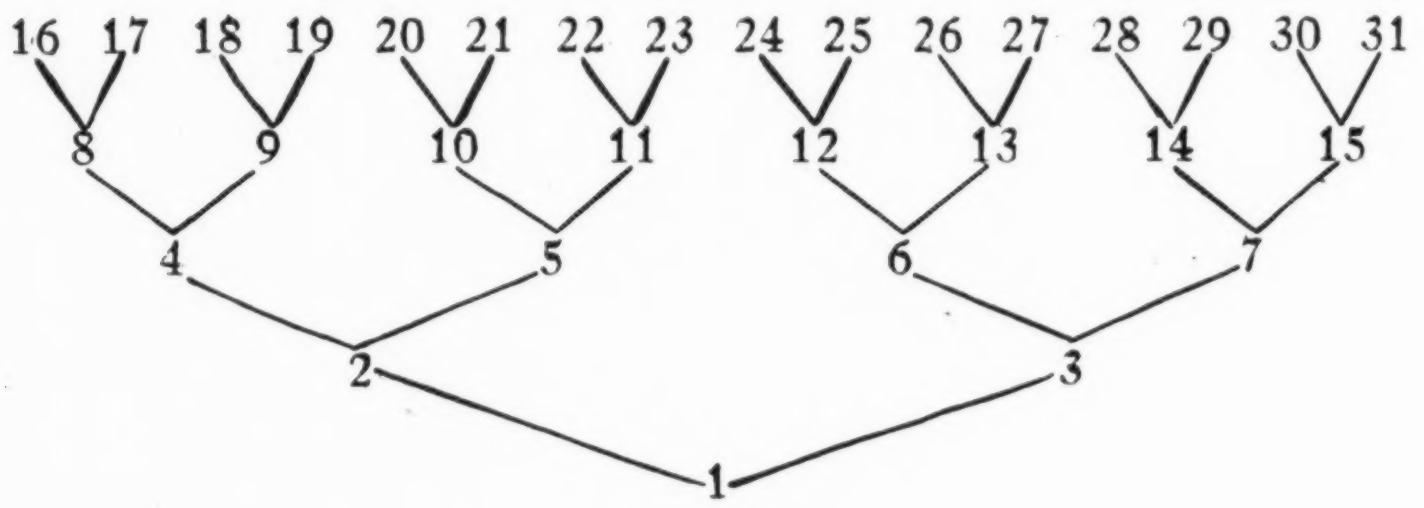
[1] These figures are based upon measurements of 167,024 white boys and girls for whom no serious defects were reported. The averages as calculated have been smoothed and corrected to allow for the inclusion in the basic figures of children with adenoids, diseased or enlarged tonsils or carious teeth, and they represent, therefore, so far as the material permits, average heights and weights of children without defects.

[2] Weights do not include clothing.

A SIMPLE SYSTEM OF DESIGNATING RELATIONSHIPS

ALEXANDER GRAHAM BELL

In dealing with the ancestry and offspring of the multi-nippled flock of sheep which I have been experimenting with for many years it has been found advisable to use contractions of various kinds, among the most valuable of which have been the numbers used to designate relationships. These numbers we call the ancestral numbers and they possess many curious properties which facilitate the investigation of questions concerning heredity. The following arrangement illustrates the scheme:



No. 1 represents the *propositus*, the individual whose ancestry we are considering.

Nos. 2 and 3 are the "First-parents" (father and mother).

Nos. 4, 5, 6, and 7 are the "Second-parents" (grandparents).

Nos. 8, 9, 10, 11, 12, 13 14, and 15 are the "Third-parents" (great-grandparents).

The "Fourth-parents" would be numbered from 16 to 31; the "Fifth-parents" from 32 to 63; the "Sixth-parents" from 64 to 127 etc. The numbering could be continued indefinitely to include higher generations.

Even numbers represent males, and odd numbers females, among the ancestors, and the ancestral number of a wife is always one more than the ancestral number of her husband. Furthermore, by doubling the ancestral number of any individual, we get the ancestral number of his or her father, and by adding one we get the mother's number. (The father of 15 is 30, the mother of 15 is 31 etc.) Conversely, by dividing the ancestral number of any individual by 2 we get the ancestral number of the child. (The child of the man 30 is 15, a female. The child of the woman 31 is 15 a female.)

One can tell at a glance which ancestral numbers represent the fathers and mothers of females because they are divided by 2 into uneven numbers, while the ancestral numbers of the fathers and mothers of males divide by 2 into the even numbers which always designate males.

The ancestral number 2, represents the father of the *propositus*, the individual whose ancestry we are considering; but it does more than this, for it seems to represent the abstract relationship indicated by the word "father." If, for example, you multiply the number of any individual by 2, you get the father's ancestral number. Thus:

The father of 2 is 4
The father of 3 is 6
The father of 4 is 8
etc.

No. 2 is the father and No. 3 is the mother. Multiply by 2 and you get the father of any individual; but multiply by 3 and you don't get the mother.

To make the ancestral numbers, in all cases, indicate abstract relationship, consider them as powers of 2, *plus* whatever figure is required to complete the ancestral number.

2. The father $=2+0$
3. The mother $=2+1$
4. The father's father $=4+0$
5. The father's mother $=4+1$
6. The mother's father $=4+2$
7. The mother's mother $=4+3$
8. The father's father's father $=8+0$
15. The mother's mother's mother $=8+7$

etc.

"Mother" $=2+1$

The mother of $2=2\times2+1=5$
The mother of $3=3\times2+1=7$
The mother of $9=9\times2+1=19$

"Maternal Grandfather" $=4+2$

Maternal grandfather of
$2=2\times4+2=10$
Maternal grandfather of
$3=3\times4+2=14$
Maternal grandfather of
$9=9\times4+2=38$

"Paternal grandmother" $=4+1$

Paternal grandmother of
$2=2\times4+1=9$
Paternal grandmother of
$7=7\times4+1=29$
Paternal grandmother of
$15=15\times4+1=61$

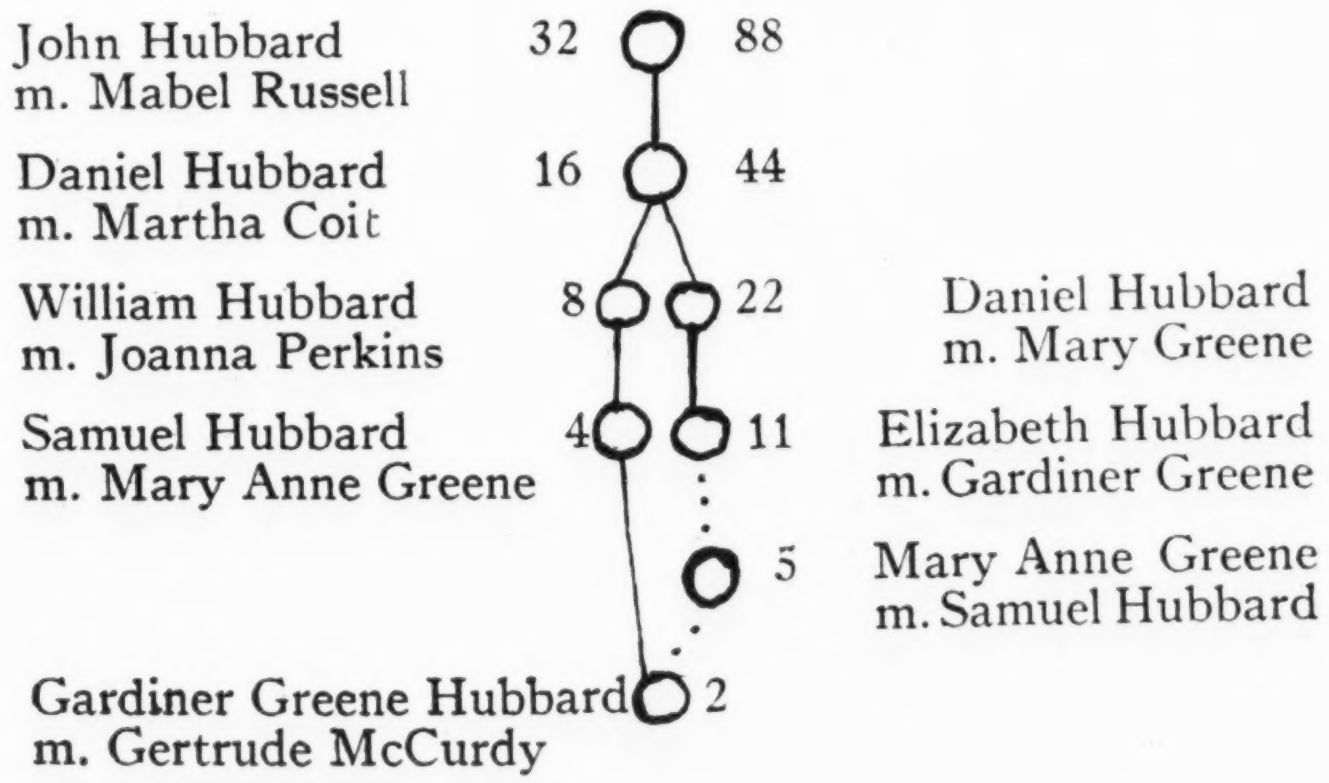
These tables indicate some of the curious properties that these ancestral numbers possess. By their use we can indicate complicated relationships in an exact manner, and in a way that cannot be expressed in words.

The system of ancestral numbers is admirably adapted for the discovery and study of consanguineous marriages as was found in my study of the ancestry of Mabel Gardiner Hubbard. (Beinn Bhreagh Recorder, Vol. XV.) It was observed that the same individual may have two or more ancestral numbers. For example: John Hubbard, who married Mabel Russel, appears as No. 32 and also as No. 88, indicating that two of his descendants have married one another. This means that Mabel Gardiner Hubbard traces up to John Hubbard by two lines.

In order tc discover the consanguineous marriage, divide both ancestral numbers by 2 until you reach the husband and wife:—

32	88
16	44
8	22
4	11
	5

Nos. 4 and 5 are husband and wife, and they are both descended from John Hubbard, (who married Mabel Russell), and the connecting numbers indicate the two threads of ancestry and the sex of the intervening ancestors. By hunting up the numbers in the list of ancestors given in the Recorder, Vol. XV, pp. 3–36, we can ascertain the names of the individuals concerned. Nos. 32 and 88 represent the same individual, John Hubbard. Represent him by a single circle:—



Nos. 16 and 44 also represent a single individual, Daniel Hubbard, who married Martha Coit, represented by a single circle. Nos. 8 and 22 are two distinct individuals, represented by two distinct circles.

Nos. 4 and 11 are two distinct individuals, represented by two distinct circles etc., etc.

The circles are connected by a thick straight line when the descent is through a male (even number) and by a dotted line where it is through a female (odd number).

We learn from this that the husband and wife (Nos. 4 and 5) were blood relatives. Their nearest common ancestor was Daniel Hubbard (who married Martha Coit). He was a second parent of No. 4, and a third parent of No. 5, so that Nos. 4 and 5 were second and third kin through Daniel Hubbard.

Through the system of ancestra numbers, consanguineous marriages are readily discovered, and the exact relationship of the contracting parties determined: It is purely an arithmetical process.

MALE AND FEMALE FARMERS IN THE UNITED STATES

The number of farms in the United States on January 1, 1920, according to the Fourteenth Census, was 6,448,-366. Of this number 6,186,813, or 95.5 per cent, were operated by male farmers and 261,553, or 4.1 per cent, by female farmers. There are no comparative figures for earlier years, since the census of 1920 was the first to obtain information separately for male and female farm operators.

The percentage of farms operated by women in the various states ranged from 1.9 in Nebraska to 7.2 in Rhode Island. In seven states the proportion of farms operated by women was 6 per cent or greater. These states were Rhode Island, with 7.2 percent; Mississippi, with 7.0 per cent; New Hampshire, with 7.0 per cent; Connecticut, with 6.9 per cent Alabama, with 6.4 per cent; Massachusetts, with 6.2 per cent; and South Carolina, with 6 per cent.

Of the 6,186,813 male farmers, 3,737,326 were owners, 67,762 were managers, and 2,381,725 were tenants. The 261,553 female farm operators were distributed as follows: 187,769 owners, 763 managers, and 73,021 tenants. In 1920, 60.4 per cent of all male farmers were owners, 1.1 per cent were tenants, while 71.8 per cent of all female farmers were owners, 0.3 per cent were managers, and 27.9 per cent were tenants.

The total land area in farms on January 1, 1920, was 955,676,545 acres. Male farmers operated 929,878,145 acres, or 97.3 per cent, of the total farm acreage, while female farmers operated 25,790,400 acres, or 2.7 per cent.

The following is a tabular classification of male and female farmers in the United States.

	Number	Per cent of total
All farm operators	6,448,366	100.0
Male	6,186,813	95.9
Female	261,553	4.1
Owners	3,925,095	100.0
Male	3,737,326	95.2
Female	187,769	4.8
Managers	68,525	100.0
Male	67,762	98.9
Female	763	1.1
Tenants	2,454,746	100.0
Male	2,381,725	97.0
Female	73,021	3.0
Land in farms, total..acres	955,676,545	100.0
Operated by males.acres	929,878,145	97.3
Operated by females .....acres	25,798,400	2.7
Average acreage per farm:		
All farms	148.2	.....
Farms operated by males	150.3	.....
Farms operated by females	98.6	.....

A GENETIC PORTRAIT CHART

According to Sir Francis Galton

In Which the Size of Each Likeness Shows the Proportion Which Each Ancestor Plays in the Children's Inheritance

DAVID FAIRCHILD

DID you ever find in the attic an old daguerreotype of some ancestor and wonder at the mystery of his blood relationship to you? Did you ever get together the photographs of all those whose actual bodily existences have contributed to your own? When you stop to think that these pictures of their faces are all that is visible today of those from whom you get your own nose, the cut of your chin, your expression, do they not seem worth preserving? Was it not after all into their faces that their friends looked to read their character when they were alive? They are not merely photographs of your grandparents as they sat for a moment in the studio of some forgotten photographer. They are the imperishable reflections cast by those wonderful personalities which have made you what you are.

In what proportion have these ancestors contributed to your particular person?

Sir Francis Galton, whose studies on human inheritance blazed the first real trail into this strange forest of ignorance, has shown that, if one should take a square to represent his total inheritance, one-half would represent the influence of his parents; one-half of what remained of the square would represent the influence of his grandparents; one-half of what still remained would be due to his great grandparents, one-half of the remaining portions to his great great grandparents, and so on in regular diminishing proportion.

This theory of inheritance, while not explaining many things, helps one to understand how quickly the influence of distant ancestors diminishes until, for example, that of a great grandparent is only one-sixteenth as much as a grandparent and only one-sixty-fourth that of a parent. To state the case in another way: the chances that one will resemble his great grandfather are only one-sixteenth as great as that he will resemble his father and one-fourth as great as that he will look like his grandfather.

HUMAN HEREDITY CHARTED BY PHOTOGRAPHS

Since the ordinary chart has too little in it that appeals to the imagination, I have covered each square with its corresponding ancestral photograph with the result shown in the accompanying Genetic Portrait Chart.

The bulk of people who are interested in the general subject of genetics are not familiar with the plants or animals on which geneticists are making their experiments (out of which are coming great discoveries). They cannot easily understand the significance of the hereditary changes which are quite apparent to the experimenters. They are accustomed, however, to looking at photographs of faces, and my idea in publishing this arrangement of my children's ancestors is to interest this class of the members in their own ancestors and get them to make Genetic Portrait Charts which will interest a considerable number of their own intimate friends and perhaps alter their point of view somewhat, bringing it more nearly in line with that of the

Note. This Genetic Portrait Chart was prepared by Mr. Fairchild for personal use, and he was naturally quite reluctant to publish it. On the ground, however, that it might arouse an interest in the subject of inheritance among those people who have little knowledge of plants and animals, photographs of which are featured in the Journal, the Council of the Association urged its publication. The system of designating relationships outlined by Dr. Bell in another article is used in this discussion.—Editor.

research men who are spending their lives in experiments to find out just how the hereditary machinery works.

The creation of better families is acknowledged to be an important step in the building of a better race, but this involves their starting by the union of good human stocks. May not the development of Genetic Portrait Charts arouse that interest in the family which must come before we can expect the creation of these better families and through them of the better race?

As pointed out in this Journal by Mr. Alexander Graham Bell "one certain means of increasing the prevalence of any hereditary characteristic in a community is to induce the individuals who possess it to marry one another." "The moment we have a body of desirable persons whose parents were also desirable, improvement of the race begins through the marriage of such persons with the normal population: for the proportion of desirable offspring born from the normal partners will be greater than in cases where the desirable partner had no ancestors belonging to the desirable class.

"The improvement will be still greater when we have a body of desirable persons who had grandparents as well as parents desirable; and still greater with each increase in the number of desirable ancestors."

RELATIVE INFLUENCE OF THE ANCESTORS

Inasmuch as one can read character in photographs and we have become very expert in doing this—for we have studied human faces all our lives—the grouping of all one's ancestors permits of a valuable comparison.

The proper arrangement places the man on the left side and the woman on the right, which throws all of the male ancestors into one line and the female ancestors into another for quick comparison. By looking to the right of Mrs. Fairchild, for example, there appear her mother, grandmother, and great grandmother in a straight line of descent. Each ancestor stands directly under his or her parents and the whole relationship of all the ancestors is evident at a glance. Naturally, if such a thing were possible, the ideal arrangement would be to have all of the photographs taken at the same age, say at 40, and from the same view.

By giving the data available as to the bodily characters of each ancestor which are known to be heritable, a more or less clear picture is obtainable of the stock from which the living representative has come.

That such photographs should interest a wide circle of people directly is evident on second thought, for the ancestry is that common to all the children of a family, for example, and all the children and grandchildren of those children. For example, my own ancestral photographs are common to four other children of my parents, fourteen grandchildren and two great grandchildren, or twenty people in all, whereas Mrs. Fairchild's ancestral photographs picture the ancestors of nine children. Together they should be of interest to twenty-nine persons besides the four living persons whose photographs appear among them.

This method of arranging ancestral photographs is capable of considerable expansion. It is true, for example, that in order to give as complete a picture as possible of the variations in the stock, photographs of all the brothers and sisters of both parents should be shown, since it is from a union of these two stocks that the children came. Children are almost as likely to resemble uncles or aunts as to resemble their own parents, and in a chart of this character the uncles and aunts should appear in the same scale as do the photographs of the parents.

A further refinement of the photographic chart would represent the brothers and sisters of the grandparents and even the great grandparents, which additions would make as complete a picture as possible of the family stocks which through their various unions have made the particular combination of characters seen in the living descendants.

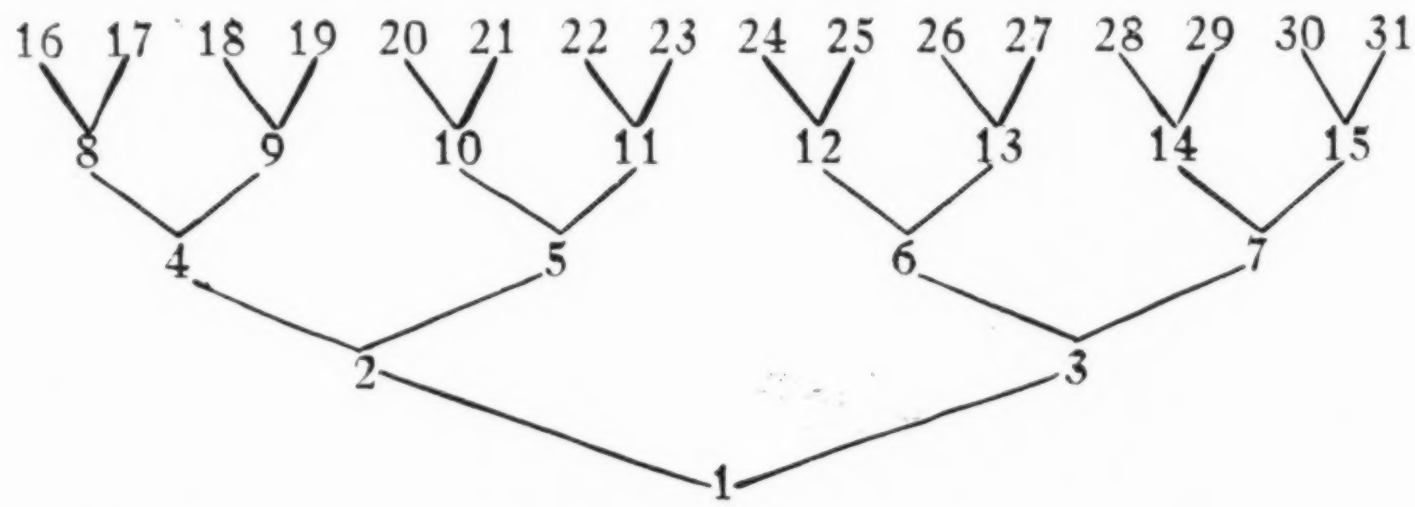
CONTROLLING THE NETWORK OF HUMAN INHERITANCE

As I look at these light reflections made by living beings, some of them a century ago, and realize that each one was the result of the union of the two (man and wife) who are directly behind him I am conscious of the resemblance of this whole structure to a network, a fabric stretching down from the distant past to the present. Each union of two souls is a knot in the network, and each individual life is a strand extending in time to the next union. And is it not a wonderful conception of human life to feel that we who still live are knots in a marvelous network of descent which has been running on since man first came into existence on this planet and which will go on until he ceases to exist here? Supposing millions could realize this and that their actions were affected by it as they are now by mysticism and that there should be inaugurated by youth throughout the world a study of this question of the unions of great human stocks, would not it lead to the building of superb strains of the human race? Is there any conceivable or at least reasonable method other than by our own conscious control of our children's inheritance to open the way to the birth of those superior human beings who we all believe are destined to inhabit this world after we are gone? Let every child study the network of his inheritance and learn to be proud of its longevity, its sturdiness, its intelligence, its lovableness, and its force of character, and when the time comes, he will hesitate to unite it with an inheritance less worthy.

To supplement this photographic arrangement with data giving such physical characters as are known to be heritable has proven a difficult undertaking, since the facts in many cases are unobtainable. Fragmentary as they are, however, they are given here to show the type of facts which might be included. Such characters as size, longevity, hearing, eyesight, complexion, baldness, color of hair and eyes, should certainly be given and, if possible, many others.

THE CHILDREN'S ANCESTORS

In this photographic study of the ancestry of Alexander Graham Bell Fairchild, Barbara Lathrop Fairchild and Nancy Bell Fairchild the system of Ancestral Numbers described elsewhere in this number of the Journal has been used. As they all have the same blood combinations, any one of them may be taken as the *propositus*, No. 1. The ancestors are then enumerated 2, 3, 4, 5, 6, etc. according to the following plan:



First parents (father and mother)

2. *Children's father*

David Grandison Fairchild 1869. Fourth of five children. Slender in youth (5 ft. 11½ inches); heavier at 45. Complexion clear. Hair light brown; beard reddish, not abundant, becoming gray early. Eyes blue, left one defective. Has worn glasses from boyhood. Hearing average.

3. *Children's mother*

Marian Hubbard Bell 1880. Second of four children. Slender (5 ft. 7 in.) Complexion olive. Hair black and abundant. Eyes dark. Eyesight un-

A GENETIC PORTRAIT CHART

ILLUSTRATING THE NETWORK OF HUMAN INHERITANCE

Showing in proper scientific relations those human beings whose combined heredities compose the actual inheritance of three American children. Is not every child entitled to see a clear picture of its ancestors, a visual representation of those who have contributed to its characteristics? Every space in the chart should contain a photograph. How many can you supply? The American Genetic Association is interested in assisting families in studies of their own heredity.

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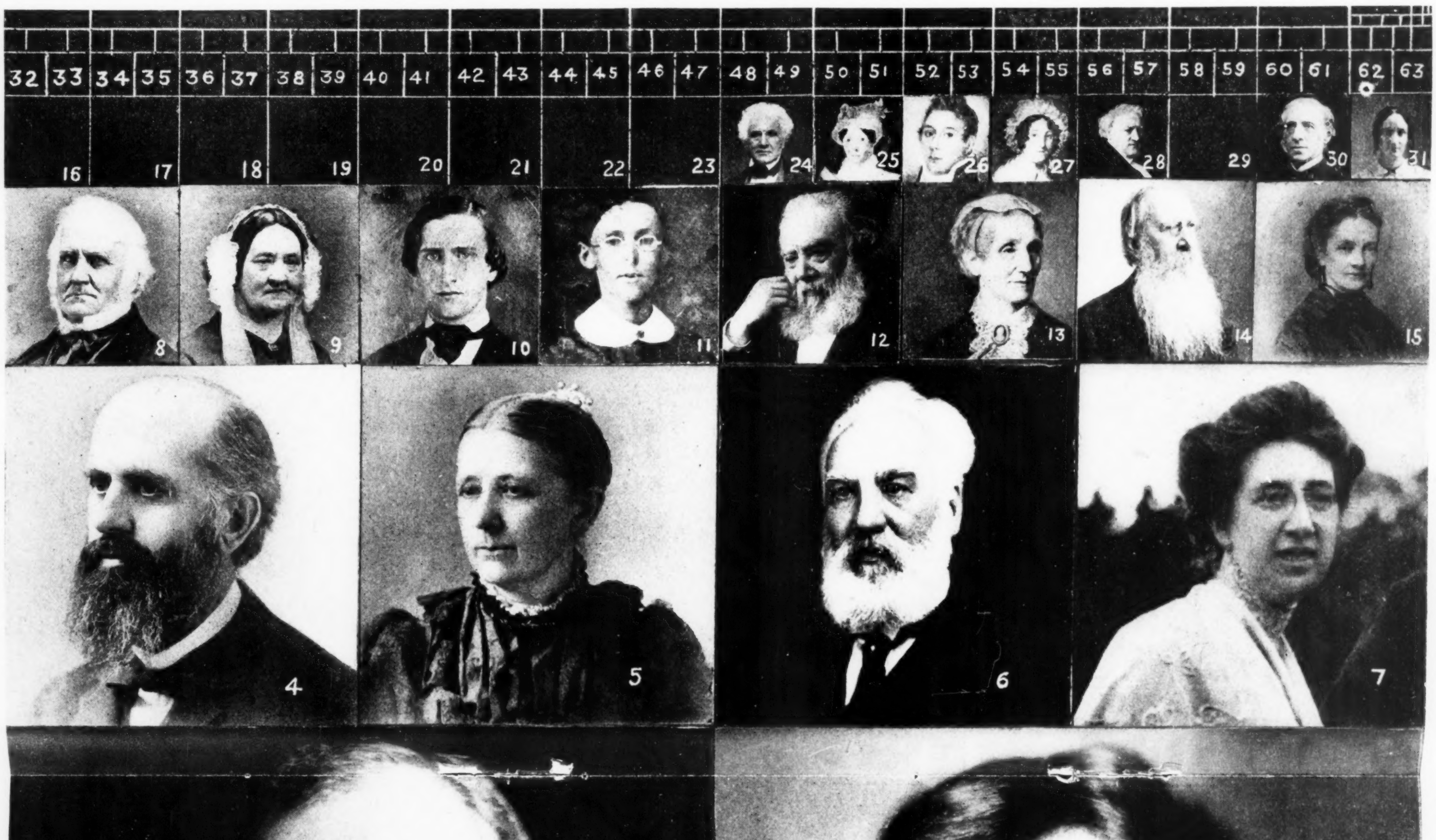

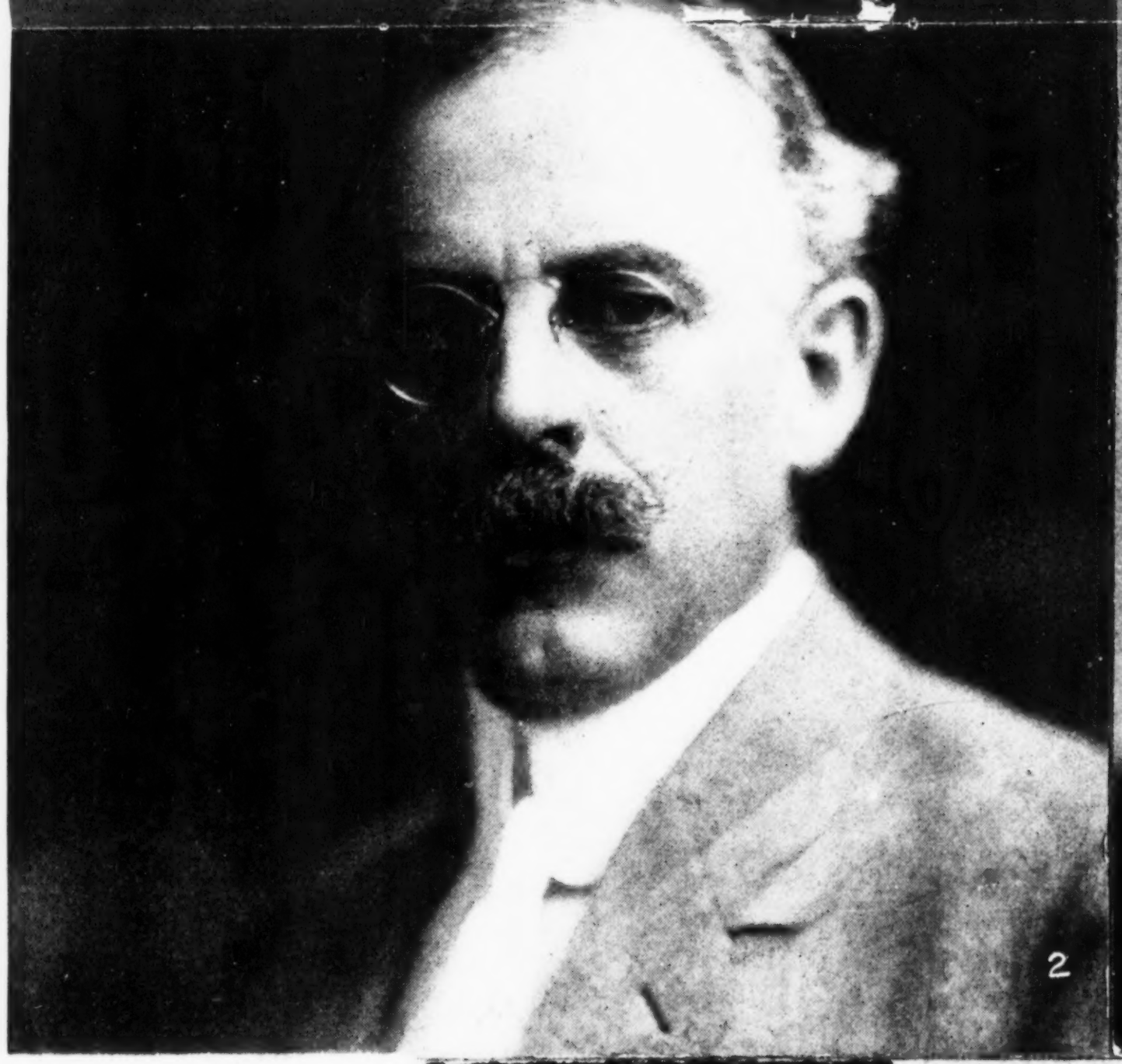

A person's total inheritance may be represented by a square. Each of the three children shown here is a product of the whole "square of inheritance" pictured above them. The top spaces should be further sub-divided as indicated in upper right corner.

Each horizontal line of photographs represents a generation. The relative influence of ancestors on the inheritance of the children is indicated by the size of the photographs, which become smaller with each preceding generation. (Fig. 7.)

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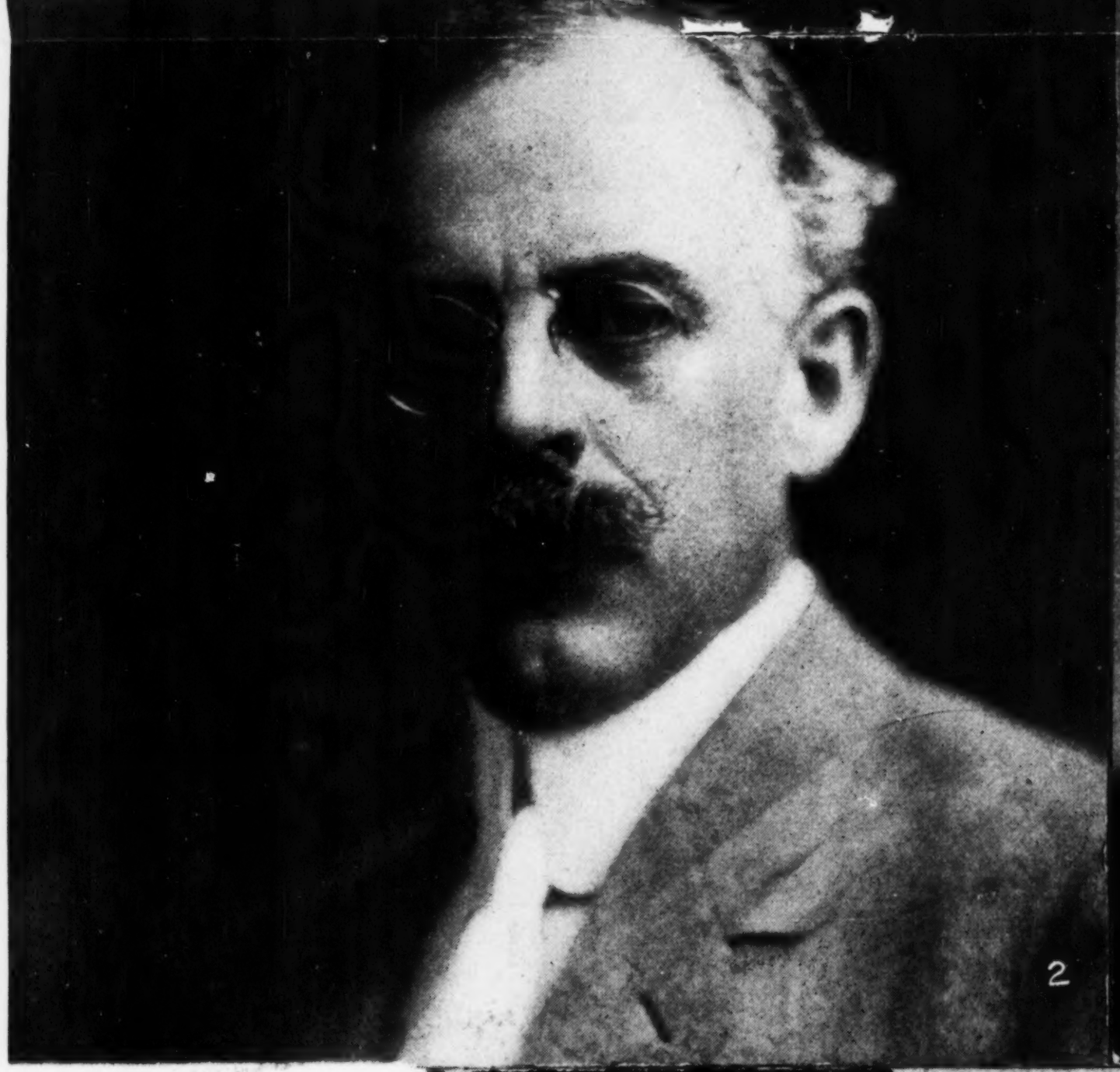

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Each horizontal line of photographs represents a generation. The relative influence of ancestors on the inheritance of the children is indicated by the size of the photographs, which become smaller with each preceding generation. (Fig. 7.)

usually good; slight muscular difficulty. Hearing excellent.

Second parents (grandparents)

4. *Children's father's father*

George Thompson Fairchild. Died in 63rd year. Tall (5 ft. 10½). Eyes intense black; eyesight excellent to 50th year. Hearing good. Musical. Hair black, turning gray. Bald forehead; dark complexion. Last born of 10 children.

5. *Children's father's mother*

Charlotte Pearl Halsted. Died in 67th year. Small and slim (about 5 ft. 6 in.). Eyes gray; eyesight good to 50th year. Hearing good until death. Hair light brown, not abundant. Delicate complexion. First born of eight children.

6. *Children's mother's father*

Alexander Graham Bell. 1847. Second of three children. Slender in youth; heavy in older age. Six feet. Olive complexion. Hair and beard black, abundant, turning white young. Eyes dark; eyesight perfect to 70. Hearing perfect to 70. Musical. Slight sense of smell.

7. *Children's mother's mother*

Mabel Gardiner Hubbard. 1857. Third of six children. Slender. Fair, clear complexion. Eyes gray, shortsighted from childhood. Hearing totally destroyed by scarlet fever at five. Hair light brown, abundant.

Third parents (great grand parents)

8. *Children's father's father's father*

Grandison Fairchild. Died in 99th year. Eyes black; eyesight good to 90th year. Hearing good to 90th year. Tall. Dark complexion. Hair dark, turning white; bald forehead. Third born of ten children.

9. *Children's father's father's mother*

Nancy Harris. Died in 80th year. Eyesight good to advanced age. Hearing good to advanced age. Hair auburn, not abundant. Medium size. Second born of seven children.

10. *Children's father's mother's father*

David Halsted. Died in 46th year after week's illness. Eyes blue. Hair black. Tall and slim. Clear complexion. Fourth born of five or six children.

11. *Children's father's mother's mother*

Mary Mechem. Died in 37th year. Eyes gray; eyesight defective. Hair light auburn, not abundant. Medium stature; frail. Delicate complexion. Seventh born of eight children.

12. *Children's mother's father's father*

Alexander Melville Bell. 1819–1905. Age at death 86. Slender in youth; heavy in old age. 5 ft. 10 in. Third of four children. Olive complexion. Hair black, abundant; reddish beard. Eyes dark; eyesight perfect to 80. Hearing perfect to advanced age.

13. *Children's mother's father's mother:*

Eliza Grace Symonds. 1809–1896. Age at death 87. Small and slight. First of large family (8). Light complexion. Hair becoming gravish. Eyes blue, deeply sunken. Eyesight good to advanced age. Hard of hearing from 10 years of age. Musical. Slight sense of smell.

14. *Children's mother's mother's father*

Gardiner Greene Hubbard. 1822–1897. Age at death 75. Tall and slim. One of large family. Complexion clear. Hair dark, becoming white. Eyes black, very short-sighted; wore glasses from childhood. Hearing perfect throughout life.

15. *Children's mother's mother's mother:*

Gertrude Mercer McCurdy. 1827–1909. 82 years old when killed in accident. Tall and slim. First of large family. Complexion clear. Hair soft brown, abundant. Eyes gray; suffered from cataract late in life. Hearing perfect throughout life. Musical.

Fourth parents (great, great grandparents

Numbers 16 to 23 not given as portraits are lacking.

24. *Children's mother's father's father's father*

Alexander Bell. 1790–1865. Age at death 75. Tall, fine figure. Second of three children. Dark complexion. Eyes dark; eyesight good until advanced years. Hearing perfect to time of death. Heavy head of white hair in old age.

25. *Children's mother's father's father's mother*

Elizabeth Colvill. 1783–1856. Age at death 73.

26. *Children's mother's father's mother's father*

Samuel Symonds. 1776–1818. In poor health for several years and died of apoplexy at the age of 42.

27. *Children's mother's father's mother's mother*

Mary White. 1788–1872. Age at death 84. Light complexion. Hearing and sight good to advanced years.

28. *Children's mother's mother's father's father*

Justice Samuel Hubbard of Supreme Court of Mass. Data lacking.

29. Portrait lacking.

30. *Children's mother's mother's mother's father*

Robert Henry McCurdy. Age at death 80. Born 1800 died 1880. Data lacking.

31. *Children's mother's mother's mother's mother*

Gertrude Mercer Lee. Born 1809 died 1876. Age at death 67. Hair black, abundant.

THE SECOND INTERNATIONAL CONGRESS OF EUGENICS

A Conference on the Results of Research in Race Improvement

As has been previously announced the Second International Eugenics Congress is being convened this year, September 22–28 1921, at the American Museum of Natural History in New York City. This furnishes the first opportunity since the London Congress in 1912 for the geneticists and eugenists of the world to meet together for discussions of the results of their researches and their application to race improvement. Leading authorities rom most of the countries of the world will present papers on the vital problems relating to human welfare.

The officers of the congress are:

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ALEXANDER GRAHAM BELL, Washington, D. C.

President

HENRY FAIRFIELD OSBORN, Columbia University and American Museum, New York

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Dr. Kristine Bonnevie, Institute for Heredity Investigation, University of Kristiania, Norway.
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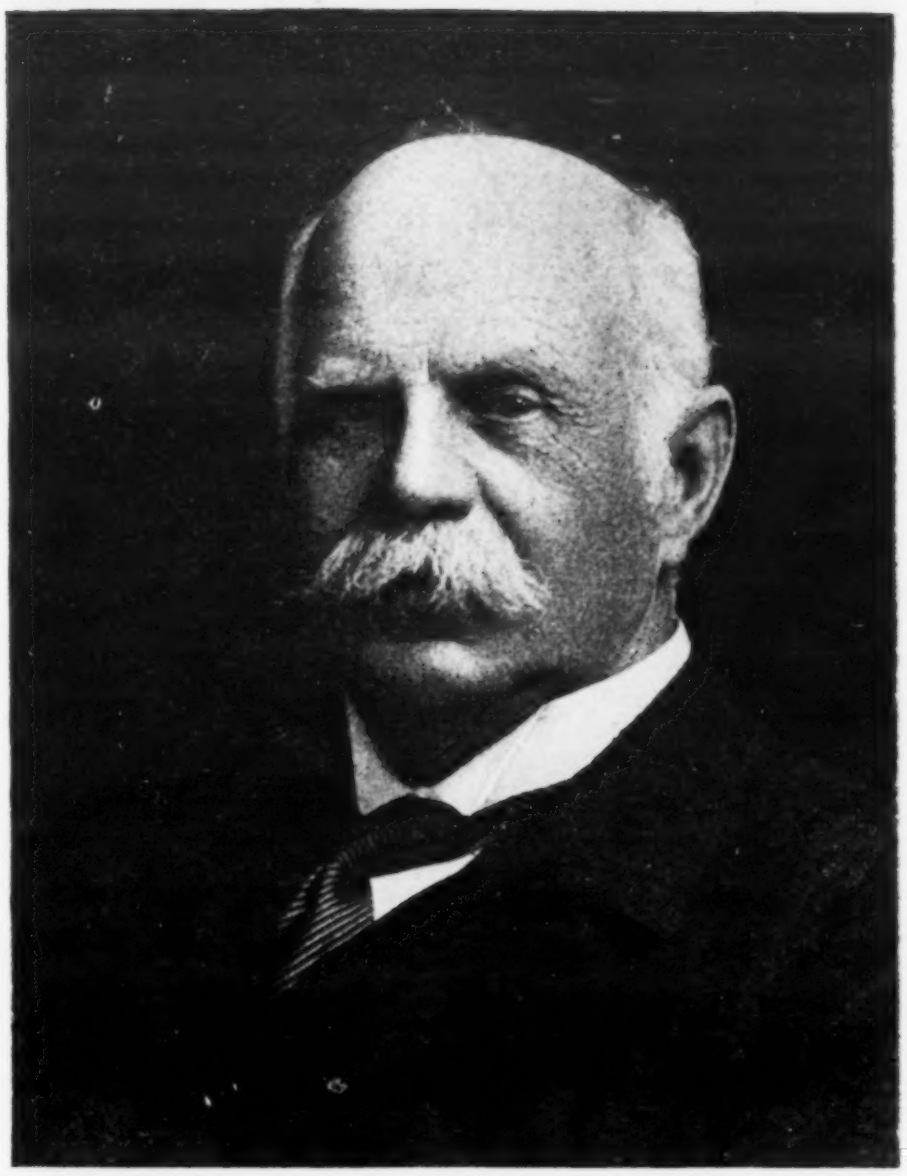
Dr. R. Pearl, Johns Hopkins University, Baltimore, Md.
Dr. Edmond Perrier, Director, Jardin des Plantes, Paris.
Dr. Ernesto Pestalozza, Rome, Italy.
Prof. R. Vogt, University of Copenhagen, Denmark.
Prof. N. Wille, University of Kristiania, Norway.

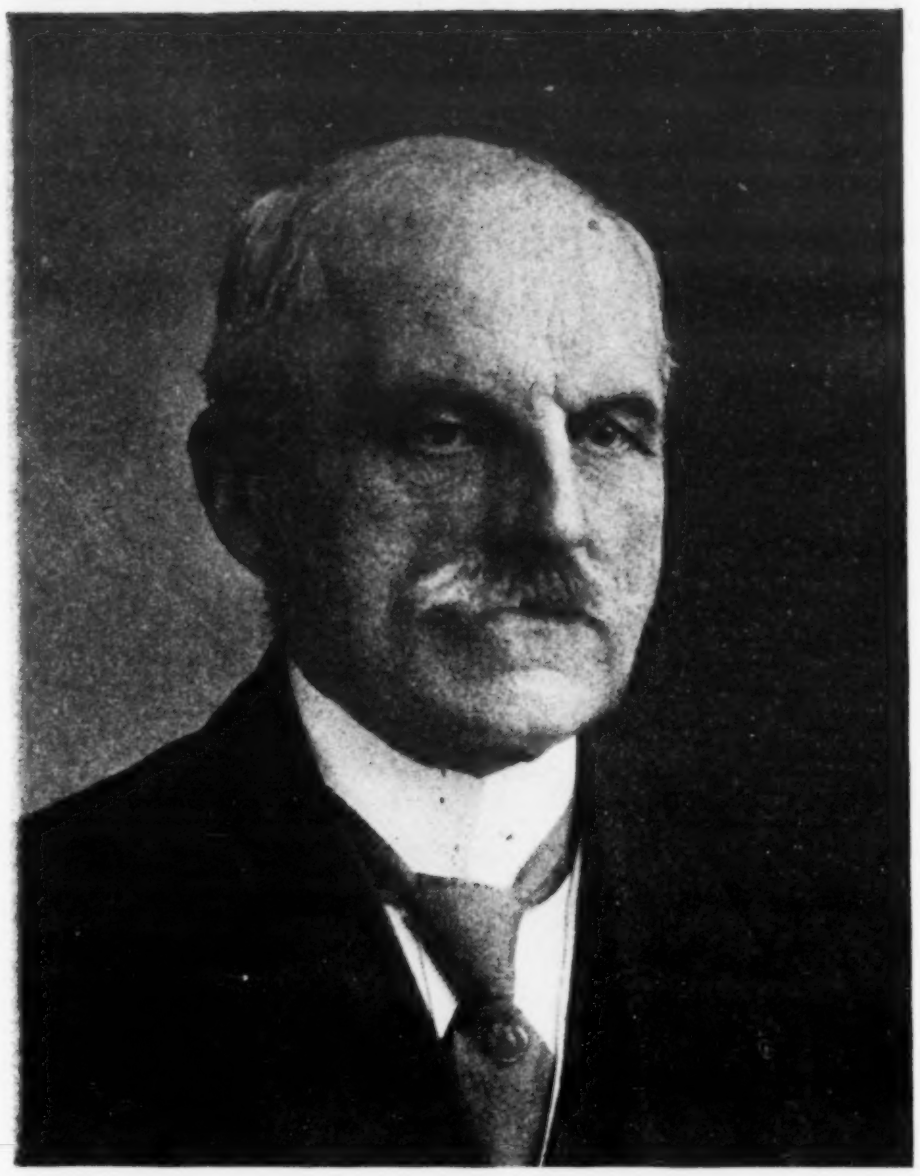
In the first section of the Congress will be presented, on the one hand, the results of research in the domain of pure genetics in animals and plants, on the other, studies in human heredity. The application to man of the laws of heredity and the physiology of reproduction as worked out on some of the lower animals will be presented

The second section will consider factors which influence the human family and their control; the relation of fecundity of different strains and families and the question of social and legal control of such fecundity; also the differential mortality of the eugenically superior and inferior stocks and the influence upon such mortality of special factors, such as war and epidemics and endemic diseases. First in importance among the agencies for the improvement of the race is the marriage relation, with its antecedent mate selection. Such selection should be influenced by natural sentiment and by a knowledge of the significant family traits of the proposed consorts and of the method of inheritance of these traits. In this connection will be brought forward facts of improved and unimproved families and of the persistence, generation after generation, of the best as well as the worst characteristics.

The third section will concern itself with the topic of human racial differences, with the sharp distinction between racial characteristics and the unnatural associations often created by political and national boundaries. In this connection will be considered the facts of the migration of races, the influence of racial characteristics on human history, the teachings of the past with bearings on the policies of the future. Certain prejudices directed toward existing races will be removed when allowance is made for the influence of their social and educational environment, and their fundamentally sound and strong racial characteristics are brought to light. On the other hand, limits to development of certain races and the inalterability through education and environment of the fundamental characteristics of certain stocks will be considered. Finally the advantages and disadvantages of the mingling of races, of unions which have proved fateful to social progress, should be discussed. In this section will be presented the results of research upon racial mixture in relation to human history. Also the topics of racial differences in diseases and psychology will be taken up. The history of race migrations and their influence

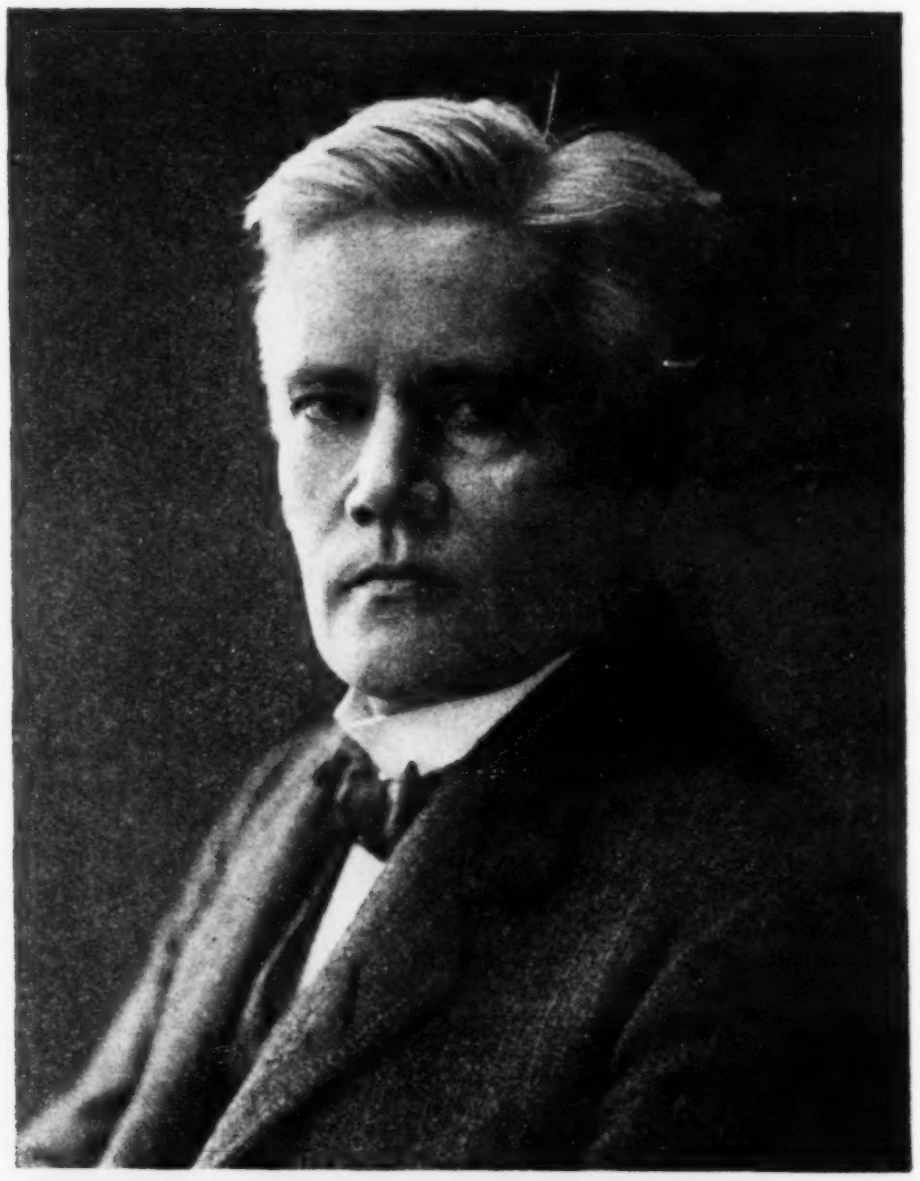


MAJOR LEONARD DARWIN
President Eugenics Education Society, London, England. (Fig. 8)



DR. LUCIEN MARCH
Directeur honoraire de la Statistique Générale de la France. Paris, France. (Fig. 9)

PROF. ERNESTO PESTALOZZA
President della Societa Italiana di Genetica et Eugenica, Rome, Italy. (Fig. 10)



DR. HERMANN LUNDBORG
Uppsala, Sweden (Fig. 11)

DR. MANUEL GAMIO
Mexico City, Mexico. (Fig. 12.)

DR. JON ALFRED MJÖEN
Winderen Laboratorium, Kristiania, Norway. (Fig. 13)

DR. N. WILLE
Chairman, Norwegian Consultative Committee for Race Hygiene, Kristiania, Norway. (Fig. 14)

PROF. VICTOR DELFINO
Buenos Aires, South America. (Fig. 15)

PROF. KRISTINE BONNEVIE
Universität, Kristiania, Norway. (Fig. 16)

DR. GIUFFRIDA-RUGGERI
Universita di Napoli, Naples, Italy. (Fig. 17)

on the fate of nations, especially modern immigration, should be set forth.

The fourth section will discuss eugenics in relation to the state, to society and to education. It will include studies on certain practical applications of eugenic research and on the value of such findings to morals, to education, to history and to the various social problems and movements of the day. In this section will be considered the bearing of genetical discoveries upon the question of human differences and upon the desirability of adjusting the educational program of such differences. Here will be considered the importance of family history studies for the better understanding and treatment of various types of hospital cases and those requiring custodial care. The bearings of genetics on sociology, economics and the fate of nations may be considered in this section.

In connection with this Congress a Eugenics Exhibit will be held including charts, maps, pictures, models and scientific apparatus so arranged that anyone of ordinary education may appreciate.

A few of the delegates from foreign countries are shown here; due to lack of time more photographs were unobtainable. It is regretted that space will not allow publication of the delegates from the United States.

The American Genetic Association is being represented at the Conference by David Fairchild and Sewall Wright.

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HERITABLE CHARACTERS OF MAIZE

VIII. WHITE SHEATHS

J. H. KEMPTON
Bureau Plant Industry, U. S. Department of Agriculture

WHITE sheath is a variation in which the leaf-sheaths and husks fail to develop chlorophyll and remain white. The line of demarcation between the sheath and the blade usually is pronounced, though in extreme cases the white area invades the base of the blade, extending a few cm. on both sides of the midrib. In general, however, it is a characteristic confined to sheaths and husks.

The character varies not only in the degree of whiteness but also in the location of the first white sheath. In the most pronounced cases the fourth sheath is the first to exhibit the lack of chlorophyll while in other individuals as many as eleven normal green sheaths are produced before the appearance of the white ones. Five progenies which breed true for the white sheath character have been isolated and in these progenies there is a tendency to develop a red pigment in the sheaths after a few weeks exposure. This coloring probably in no way is attributable to the lack of chlorophyll, and appears equally intense in both the white and normal green sheaths, though naturally more conspicuous on the former.

STRIKING AS ORNAMENTAL PLANTS

Plants which develop the white sheath character early and to a marked degree are very striking and like the Japonica striped strains may be of value as ornamentals. The most extreme strain that has been isolated shows the character to be detrimental to vigorous growth, although no reduction in vigor is noticeable in plants of moderate whiteness.

A HERITABLE CHARACTER

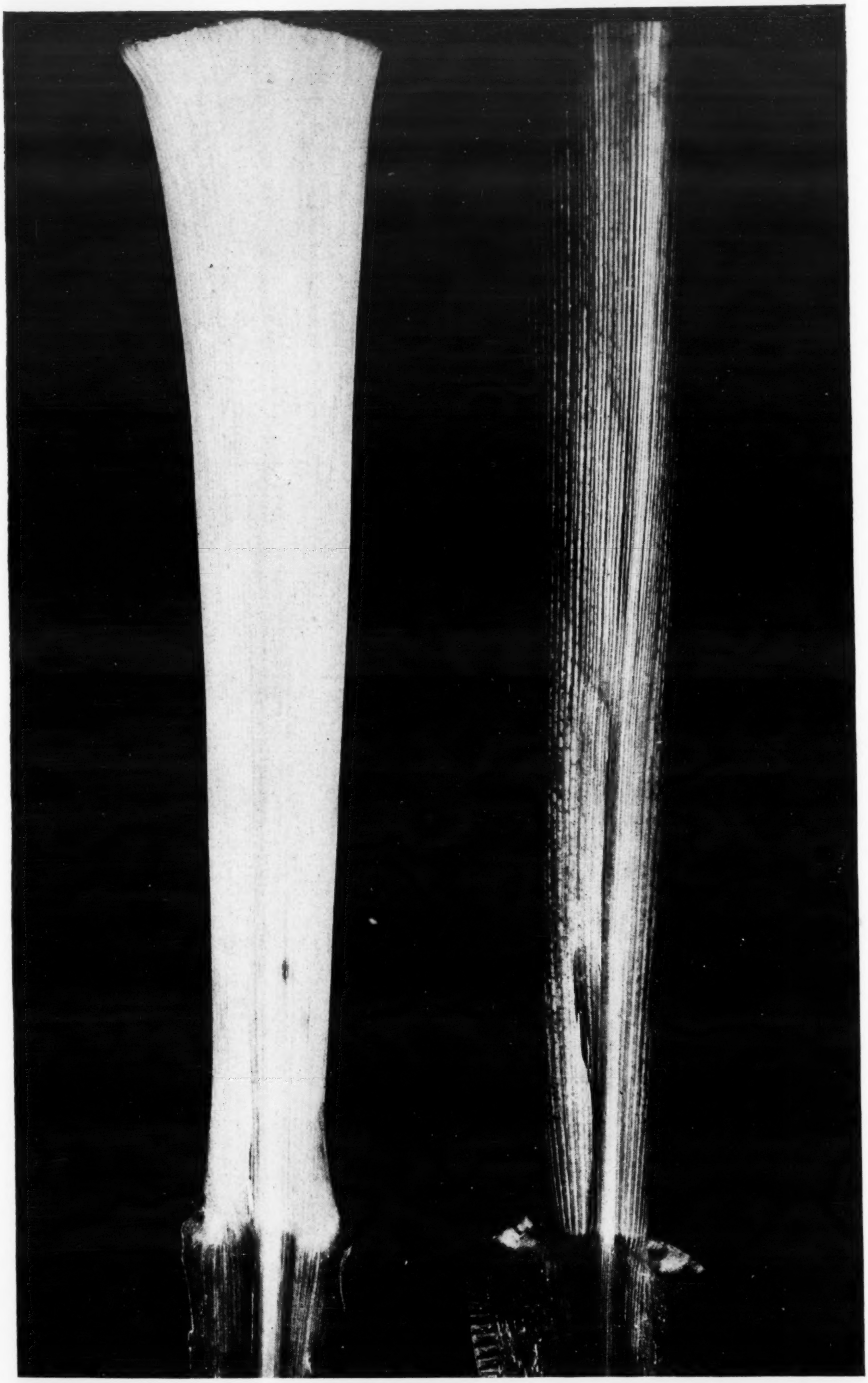
The character appeared simultaneously in two sister progenies of a Pawnee variety, the original ear of which was obtained from M. R. Gilmore of Lincoln, Nebraska. These progenies were the result of self-pollinating the original strain for two years. In both progenies the number of plants with white sheaths indicated that the character was a simple Mendelian recessive, the actual counts being 29 green 11 white sheaths and 30 green, 12 white sheaths respectively. The two progenies, however, differed markedly in the degree of whiteness, one having the color of the sheaths and blades sharply contrasted while in the other the sheaths were noticeably greenish. Individual plants in both progenies varied in the degree of whiteness and subsequent progenies show the differences to be heritable.

Self-pollinated seed from white sheath plants produced only plants with white sheaths but self-pollinated sister green plants or green plants from sister progenies do not give uniformly Mendelian ratios. This is shown in Table I, where the progenies of self-pollinated green plants are classified.

TABLE I: *Classification of the progenies of self-pollinated green plants which produced some plants with white sheaths. The first four progenies are descended directly from the strains in which the white sheaths first appeared while the others are from sister progenies.*

Character of Parental Progeny	*Number Green*	*Number White Sheaths*
Sheaths and blades sharply contrasted	67	13
Sheaths and blades sharply contrasted	23	8
Shealthes and blades poorly contrasted	53	3
Sheaths and blades poorly contrasted	60	3
Sheaths green	51	2
Sheaths green	32	3
Sheaths green	67	3
Sheaths green	69	2
Sheaths green	50	7

The deficiency, from the standpoint of a simple Mendelian character, of



LEAF SHEATHS OF MAIZE

The white sheath in maize is a variation in which the leaf-sheaths and husks fail to develop chlorophyll, thus remaining white. The character varies in degree of whiteness and has been found to breed true. Plants with white sheaths are striking in appearance and may be of use as ornamentals. The sheath at the right in the photograph is without chlorophyll although the blade is normal green. Natural size. (Fig. 18.)

white sheath plants, may be due to the variability in expression resulting in an improper classification.

Crosses have been made with plants of other chlorophyll variations and the first generations of such crosses invariably are normal green in color. Even in crosses with the variegated Japonica strains where the stripes commonly appear on the sheaths as well as the blade, often resulting in a wide white band on the sheath, the first generation plants have normal green sheaths. In a small population of a second generation hybrid between white sheaths and Lineate the white sheath character reappeared but as yet the numbers are too small to indicate relationships. A stock of seed of this white sheath variation has been obtained and a limited quantity will be supplied to interested investigators.

RECORDS SHOW NO RADICAL CHANGE IN SEASONS

"The seasons are changing; we do not have the cold weather we did when I was a boy." Remarks similar to this are frequently heard by representatives of the Weather Bureau, United States Department of Agriculture, but reports on the weather dating as far back as 1780 show that there has been no radical change in the mean temperature from year to year.

An official of the Weather Bureau has compiled the following table from records taken by various observers previous to 1872 and from those of the Weather Bureau Station at New Haven, Conn., from 1873 to the present.

For the 10 years ending—	Mean temperature
	°F
1790	49.6
1800	50.0
1810	50.4
1820	47.5
1830	49.3
1840	47.8
1850	49.2
1860	48.9
1870	49.1
1880	49.7
1890	48.9
1900	49.7
1910	49.7
1920	50.5

It will be noted, the official points out, that the warmest three periods are those ending in 1800, 1810, and 1920, and that the coldest decade immediately follows the second warmest.

Considering the individual months and the individual years, it is found that the coldest January occurred as late as 1857. The coldest February occurred eight years after the warmest one. The coldest March was as late as 1870 and again n 1885. The coldest April was in 1874, and many years after the warmest one. The lowest temperature in May was in 1812, 1815, 1870, and 1882. The highest figures in June are in 1779, 1790, 1803, and 1876. In July the lowest was in 1816, with the warmest as early as 1780 and equaled in 1876. The coldest August occurred 61 years after the warmest. In September the coolest months are in the earlier years, but for October, November, and December the coldest year came after the warmest year in each case.

Thus it will be seen that in nine months of the year the coldest one of record occurred after the warmest one. These figures seem to indicate very clearly, the weather official says, that since the time of the Revolutionary War, at least, there has been no permanent change in temperture.—*Weekly News Letter, U. S. Dept. of Agri.*

BUD VARIATION IN ELEAGNUS

C. S. POMEROY
Riverside, California

THERE are a large number of ornamental Evergreen plants that are quite generally grown in Southern California and several of them have forms with variegated foliage which are usually considered to be much more beautiful than the solid green forms. These plants are commonly propagated by cuttings of mature or half-ripened wood and so far as the writer has been able to learn all the variegated forms have originated as bud variations in plants of the typical green forms. Descriptions of some of these variations have been presented in these pages during the past few years, together with illustrations showing instances of the various green and variegated forms occurring on the same individual plants.[1] Similar instances of variegated variations in orange and lemon trees have also been described and illustrated.[2]

ATTRACTIVE FOLIAGE OF VARIEGATED FORMS

Two variegated forms of the shrub *Eleagnus pungens* have come to the attention of the writer in one of the city parks of Riverside, California, and in both instances branches have been found on the plants that are made up entirely of non-variegated leaves showing a reversion to the solid green forms from which the variegated forms doubtless arose as bud variations.

The various species of this genus represent a group of shrubs or small trees that are grown chiefly for their handsome foliage and decorative fruits and the variegation of the two forms mentioned makes the varieties particularly attractive and desirable as specimen plants or in ornamental groups or hedges. In one of these forms, variety *Frederici variegata* (fig. 1), the light colored areas occur as irregular streaks or blotches in the centers of the leaves, and in the other form, variety *aurea* (Fig. 2), the light color is usually confined to the margins of the leaves, though frequently the chlorophyll disappears from larger areas, sometimes absent from the entire leaf.

Eleagnus pungens is a spreading shrub, ordinarily considered as reaching a maximum of six feet in height but one of the specimen plants with which the writer is familiar is fully 15 feet high. The branches are reddish brown and usually spiny, the leaves are alternate, short-petioled, entire, oval or oblong, with both ends obtuse, undulate and often crenulate at the margin, clothed with silvery scales when young, at length becoming glabrous above, silvery beneath, more or less interspersed with brown scales, two to four inches long. The flowers are inconspicuous but fragrant and are borne in the fall in axillary clusters. They are apetalous and perfect, the tube cylindrical, slightly narrowed at the base, longer than the limb, perianth 4-lobed, stamens four, included, on very short filaments. The fruit is a 1-seeded false drupe, red when mature, short-stalked, about three fourths of an inch long, covered with

[1] Shamel, A. D.
A Bud Variation of Pittosporum. Jour. Hered., Vol. 8, No. 8, Aug. 1917, p. 357–358.
A Bud Variation of Euonymus. Jour. Hered., Vol. 8, No. 5, May, 1917, p. 218–220.
Origin of the Striped Cane. Jour. Hered., Vol. 8, No. 10, Oct. 1917, p. 471–472
Origin of the Striped Oleander. Jour. Hered., Vol. 12, No. 1, Jan. 1921, p. 42–45.

[2] Shamel, A. D.
An Orange Bud Variation. Jour. Hered., Vol. 8, No. 4, April, 1917, p. 176–177.
Shamel, A. D., Scott, L. B., Pomeroy, C. S., and Dyer, C. L.
In Citrus Fruit Improvement: A Study of Bud Variation in the Eureka Lemon. U. S. Dept. Agric., Bul. 813. See p. 21–22 and pl. V.

BRANCHES FROM A SHRUB OF Eleagnus pungens var. aurea (Servettaz), AN OLEASTER

At the left are some typical leaves with light colored margins. At the right are two small branches bearing leaves that show no chlorophyll, and in the center is shown a branch which has sported back to the original solid green color, none of the leaves on it showing any variegation. Plants with variegated foliage are usually much more beautiful than the solid green forms. (Fig. 19.)

A LARGE BRANCH FROM A SHRUB OF Eleagnus pungens var. Frederici variegata (Servettaz), WITH VARIEGATED FOLIAGE

The foliage on this plant is normally solid green in color, but variegated forms have originated as bud variations. The three upper small branches in the illustration are shown sporting back to the solid green leaf color of the type of this species. At the bottom is a twig which has leaves of the solid green color along one side and variegated leaves along its opposite side. (Fig. 20.)

silvery or brownish scales. This species is native to Japan and China and is hardy only in the southern part of the United States.

Servettaz describes the flowers of the variety *aurea* as differing from the type species in having larger lobes which are quadrangular instead of of triangular, the tube is not narrowed at the base and no fruit is produced. The writer has not had an opportunity to observe whether or not the specimens of *aurea* will fruit under conditions at Riverside.

CLASSIFICATIONS DIFFICULT

This genus, Eleagnus, gives its name to the Oleaster family (Eleagnaceae) the word being an ancient Greek name meaning a kind of willow, from *Elaios*, olive. In European countries this genus is known as the wild olive from the resemblance of its most common species to the true olive, though the two plants belong to entirely unrelated families. Plants of the oleaster family are distinguished by their peculiar scales, perigynous flowers, the l-celled, l-seeded ovary and the fleshy but free receptacle.

No less an authority than J. D. Hooker wrote that "in no genus of shrubby flowering plants are the species more difficult of definition by characters of habit and foliage than are those of Eleagnus." The tedious task of monographing this genus has been painstakingly accomplished by Dr. Camille Servettaz.[3]

He states that (translated) "The division of the genus Eleagnus into species presents great difficulties, for certain species distributed over large geographical areas and under different climates show extreme variations which it is sometimes almost impossible to classify. In order to definitely determine a plant of this genus it is necessary to know, for example, if it flowers in spring or autumn, if its flowers appear at the same time as the leaves or later, if they are located at the base, at the top or along the entire length of the branch, if its leaves are persistant or not, if its floral stem continues its growth or remains unchanged during the ripening of the fruit, etc., etc. It is by these biologic characters that specific determinations are most certainly established much more than by morphological characters for the representatives of the genus are variable enough when following the mean."

It is quite possible that many of the different forms which were such a puzzle to Servettaz in his systematic classifications were of the type of nonheritable variations due to climatic or other causes but it is also quite possible that some of them were true bud variations. Indeed Servettaz recognized this possibility in establishing a species *submacrophylla* which he characterized as comprised of "various midway between *E. pungens* and *E. macrophylla*, which were doubtless hybrids or mutating forms."

In any event there is no doubt of the bud origin of the variegated forms described and illustrated herewith nor of their commercial stability during successive bud generations under the continual asexual propagation of ordinary horticultural practise.

[3] Monographie des Eleagnacees in Bot. Centralblatt, Beihefte 25, pt. 2, p. 1–128 (1908).

Friendship and Sexuality

FREUNDSCHAFT UND SEXUALITÄT, von Dr. Placzek, Nervenarzt in Berlin. Fünfte, fast unveränderte Auflage. Pp. 160, preis M.12. Bonn, A. Marcus and E.Webers' Verlag, 1920.

Dr. Placzek's book, which seems to have attracted a good deal of attention in Germany, offers little of special interest to the geneticist. His thesis is that friendship is largely based merely on the attraction of personalities, and that modern psychologists who attempt to read a sexual element into all types of friendship are in error.—P. P.

MEASURING HUMAN INTELLIGENCE

"Why should we not ascertain the grade of intelligence necessary in every essential occupation and then entrust that work only to those people who have the necessary intelligence?" Dr. H. H. Goddard thinks this would not be difficult to do. His convincing book is here reviewed.

PAUL POPENOE

WHEN psychologists announced, after examining 1,700,000 men, that the average mental age of men in the army was about 13 years, they attracted widespread attention to the doctrine of mental levels. But, says Dr. Goddard, let us not commit the fallacy of the average. "The average only means that there are about as many of lower intelligence as of higher.

"We have seen that while the average is perhaps thirteen to fourteen years and there are 25,000,000 people of this intelligence and 45,000,000 still lower, there are also 30,000,000 above the average and 4,500,000 of *very superior intelligence.*"

Dr. Goddard discusses at some length the way in which these levels of intelligence are measured, and the validity of the methods used.

"The theory of mental levels holds," he says, "that every human being comes into the world with a potentiality for mental development that will carry him just to far, and that barring those accidents that may stop a person from reaching the development that would have been normal to him, nothing can, to any great extent, affect the mental level to which he will finally attain.

"Why is this view hard to accept?"

KNOWLEDGE VS INTELLIGENCE

"Probably the first and most important reason is that we have generally confused intelligence with knowledge. Having no way to evaluate either one we have been lost in the intricacies and confusion results. . . The second important reason why the theory of mental levels is hard to accept is to be found in the fact that while we know children generally increase in intelligence from birth to maturity, we have never appreciated the exceptions."

There are many theoretical grounds for believing that intelligence develops, and that it can be tested; but in Dr. Goddard's opinion the army experience, in which the results of the tests coincided so well with the actual experience and observation, put the doctrine beyond argument. "With this army experience it is no longer possible for any one to deny the validity of mental tests, even in case of group testing and when it comes to an individual examination by a trained psychologist, it cannot be doubted that the mental level of the individual is determined with marvelous exactness."

Such considerations throw real light, the author thinks, on the search for national efficiency. For the first time Society has an instrument with which to work. If the mental level of every individual in the nation should be determined, it would be possible to apportion the available jobs intelligently, preventing good men from wasting their time on inferior jobs, and protecting the public from having mentally inferior persons in positions of responsibility, where they now often are.

"It is natural to raise the question just here as to whether it would

[1] HUMAN EFFICIENCY AND LEVELS OF INTELLIGENCE, by Henry Herbert Goddard, director of the Bureau of Juvenile Research of Ohio. Lectures delivered at Princeton Univ., April, 1919. Louis Clark Vanuxem Foundation. Pp. 128. Princeton Univ. Press, 1920.

not be a serious humiliation for an individual to discover that he has not sufficient intelligence to undertake a given line of work. The reply is first, whatever the momentary humiliation, it can never compare with the humiliation of failure that is sure to come later, or with the unhappiness that is the constant accompaniment of worrying through the years working at a task that is beyond one's ability.

"The second answer is, that it is only a question of custom and frequency. For a single individual to be pointed out as not having sufficient intelligence to become a doctor while the rest of his group were supposed to have the requisite intelligence, would be somewhat humiliating; but if the intelligence of each member of the group were determined and all were found to have approximately the same, even though it were below that required for a particular profession would not be humiliating. Moreover, it is not so new and strange as it first appears. Many people today are advised not to undertake this or that profession or business because they have not the requisite qualifications. The application of the facts of mental level is only a more scientific way of getting at the same result."

THE INFLUENCE OF EMOTIONS

It has, of course not infrequently been objected that the mental level of a person is not sufficient; that the emotional nature is quite as important. The man of violent emotion is liable to be inefficient through a wasting of his energy in emotional outbursts, while the man of weak emotions is apt to be inefficient because he does not have the emotional stimulus to hold him up to his capacity. Besides that, the man who is emotionally despondent or chronically unhappy does not do good work, and tends to make others unhappy as well as himself.

"While all this is profoundly true, it must not be overlooked that the level of intelligence to a large degree determines the extent to which the individual either controls these tendencies of his emotional life or fails to control them. Nor must we forget the danger of reasoning in a circle here, since much of the chronic unhappiness is directly traceable to the fact that the individual is attempting to do a work for which his intelligence is not equal. Again, many times the emotional outbreak is due to an uncongenial environment which a better intelligence would prompt him to change. Still better, as we shall see later this emotional condition has a physical basis, which while sometimes beyond control, is nevertheless in many cases capable of being modified by a use of sufficient intelligence. So that while, in view of these facts of the emotional life, we may not say that one's efficiency is entirely proportionate to his mental level, we can at least feel safe in declaring that a low level will exercise little or no control over the emotional life and therefore, those instincts and emotions which would tend to inefficiency will have their full force instead of being modified and controlled as they are by higher intelligence. So that in determining the mental level of an individual, we are ascertaining how much power of control he has over these fundamental instincts and emotions, a fact which is obviously of no small value."

But, it is asked, are these levels fixed and unchangeable? "To take a concrete example, suppose a young man has the ambition to become a physician. Even though he should find he has a low mental level, emotional peculiarities and temperamental idiosyncrasies, will not his ambition make up for all these negative conditions, so that he succeeds in spite of them? The reader will undoubtedly be able to cite instances that seem to indicate that this is the fact, but because the mental level has never been determined in these cases, it is possible to say they are not cases in point because the mental level may have been adequate to the accomplishment of the task, and consequently it was not a case of the ambition or the circumstances

overcoming mental weakness. Moreover, we are compelled to conclude that this is actually the situation because of what we know of the nature of intelligence. This comes from the fact that these conditions we are discussing are definitely determined by a physical condition which is, to a high degree unchangeable.

"The study of feeblemindedness has confirmed our belief that intelligence is a matter of brain cells, and neuron patterns, and still more definitely, it is a question of the development of the larger association areas of the brain the functioning of which develops relatively late, and hence this development is particularly liable to arrest; moreover, when such arrest has taken place, there is no evidence that it ever starts up again. This means of course, that once a person's mental level is determined, there is no known method of changing it."

GREAT NUMBER OF MISFITS

In the light of this doctrine, "it is easy to see why human society is relatively inefficient. Knowing nothing of mental levels beyond a crude appreciation of the fact that some men are certainly more intelligent than others, we have made no serious attempt to fit the man to the job."

"When one contemplates the enormous proportion of misfits that must exist in the industrial world and that such misfits mean discontent and unhappiness for the employee, one can but wonder how much of the present unrest in such circles is due to this fact. A man is doing work that is well within the capacity of his intelligence and yet that calls forth all his ability is apt to be happy and contented and it is very difficult to disturb any such person by any kind of agitation."

One of the most serious phases of the problem concerns the lowest 10%. These make up the delinquents.

"A delinquent is literally one who has been left behind." He is "the one who does not come up to the mark in the performance of those duties which the group has placed upon every member." Hence he is a tremendous drag on the efficiency of the group. The recognition of the doctrine of mental levels will make it much easier to deal with these, and preventive methods that can be rationally applied may be counted on greatly to cut down the cost of caring for the feebleminded.

CAN THERE BE A DEMOCRACY?

But looking at the larger problem, what about democracy itself? Can we hope to have a successful democracy where the average mentality is 13?

There are, as was pointed out at the beginning of this review, thirty million above the average, and 4,500,000 of very superior intelligence. "Obviously there are enough people of high intelligence to guide the Ship of State, if they are put in command.

"The disturbing fear is that the masses—the 70,000,000 or the 86,000,000—will take matters in their own hands. The fact is, matters are already in their hands and have been since the adoption of the Constitution. But it is equally true that the 86,000,000 are in the hands of the 14,000,000 or the 4,000,000. Provided always that the 4,000,000 apply their very superior intelligence to the practical problem of social welfare and efficiency.

"Lower intelligence will invariably and inevitably seek and follow the advice of higher intelligence so long as it has confidence in the individuals having the higher intelligence. That is a proposition so invariable as to be recognized as a law of human nature. . . Whenever the 4,000,000 choose to devote their superior intelligence to understanding the lower mental levels and to the problem of the comfort and happiness of the other 96,000,000 they will be elected the rulers of the realm and then will come perfect government—Aristocracy in Democracy."

In passing, Dr. Goddard suggests that the feebleminded ought not to be allowed to vote. He then considers the equalitarian ideas that lead to

Bolsehvism, pointing out that "the different levels of intelligence have different interests and require different treatment to make them happy, and we are committing a serious fallacy when we argue that because we enjoy certain things, everybody else could enjoy them and therefore ought to have them." Social equality is psychologically impossible.

MENTAL LEVELS OF SCHOOL CHILDREN

"We must now consider what is the wise procedure with the various low levels of intelligence. As we stated in an earlier lecture, all work looking to the eventual control of this problem of social efficiency as conditioned by mental levels, must begin with the children. When children enter school their mental level should be determined. Several groups will be found. At the top are those who are exceptionally intelligent, well endowed, who test considerably above their age. This group subdivides into two: first, those who are truly gifted children and second, those whose brilliancy is coupled with nervousness. The superior mentality of the truly gifted will mark them throughout life. They should have the broadest and best education that it is possible to give, not necessarily hurried through the grades at the most rapid rate but while advancing somewhat faster than the average child, they should be given a broader experience. There should be opportunities for them to do many things, in each year, that the average child has not time to do.

"The nervously brilliant group is a very important one. It contains those children who are brilliant in school but whose brilliancy is evidently due to a very high-strung nervous system. It is a case of the well-known but little understood relationship between genius and insanity. While these children may probably not be called insane they are nevertheless in a stage of nervous instability which, while it happens to make them keen, acute, and quick, and they give the appearance of brilliancy; on the other hand it is an exceedingly dangerous situation since experience has taught that a little pushing or overwork may very easily throw them over definitely on the insane side. These children should be treated with the very greatest care.

"A second group comprises the moderately bright children, a little above average and yet not enough to be considered especially precocious. They should, however, have their condition taken into account and they should not be compelled to drudge along with the average child.

"Then comes the *average child* for whom our school systems are at present made, and the only group whom they adequately serve. The question whether the training that we are giving this group in the public schools is the best that can be devised is not for us to discuss here.

"Our next group is the backward. Those children who are not quite up to age, who have considerable difficulty in getting along with their work and yet who do get along after a fashion. This group should be carefully watched from the start and eventually they will differentiate again into two divisions, possibly three. Perhaps some of them may later on catch up with the average child. Some of them will go through their whole educational career with the same slowness, nevertheless they will get through. There are still others, who while only a little backward at this first examination, later on will show that they are actually feebleminded children.

"Finally there is the group of definitely feebleminded. In many cases it will not be possible, at this time, to predict what their final mental level will be. This group will ultimately divide into several grades according to their mental level. There will be the morons with their three or four subdivisions, that is to say, those who have a mentality of eight, those of nine, or ten or eleven, perhaps of twelve. Then come the imbeciles with their mentality of seven and six and five;

and each of these should receive special training and treatment.

"The lower grade imbeciles will probably not get into the school but will be recognized at home as defective and kept there until they can be placed in an institution for the feebleminded.

FITTING THE TASKS TO THE CHILD

"Now it is impossible to decide from this single examination of the children on entering school just what kind of training is best for each one. Consequently with many of them it will perhaps be necessary to start with the regular work of the first grade, but they must be carefully watched and if it is found they are not progressing like the other children then they should promptly be placed in the other group where children are taught to do things rather than to read and write about things.

"The group that is recognized as distinctly feebleminded should not be worried with reading and writing at all, but should at once be placed in a group where they will be taught various activities. The purpose of this kind of training is twofold, first to develop physical coordinations and second to train them to do useful things. They may all be started at the same point but the relatively brighter ones will progress faster and should the more quickly get on into industrial and vocational training.

"The starting point for these cases is the care of their own person. These children generally have not been taught to wash their faces and hands and comb their hair, still less to bathe. These matters should be carefully taught until they become habits." Then comes dressing, taking care of their rooms, sewing and the like. A few may even learn to read and write. Those that are diagnosed definitely as feebleminded should be committed to some suitable institution. Many of them may be taught some industrial occupation and "graduated" into useful places in society.

WHEN TO GIVE MENTAL TESTS

"Coming back now to those children who are at age or above age and are doing regular school work, they should be given mental tests whenever it is proposed to promote them to an advanced grade. It will thus be ascertained whether they have the mentality for doing the work of that grade. Whenever it is shown that they have not the capacity, they should be transferred to special work within their capacity, and their development carefully watched.

"When it comes to high school it is most inportant that their mental level be determined, because there are many children who get through grammar school fairly well but have not the mentality for high school work. This fact should be determined and these people allowed to leave school and go into industries rather than be forced on into high school. Again, each year in the high school probably requires a higher level and some will fall out at each step. This brings us to the college. There is a prevalent idea that every child who has the means and gets through high school should go to college. The teachers in college have long known that many who enter should never attempt to do college work."

MENTAL TESTS FOR OCCUPATIONS

The same principle might be applied, Dr. Goddard thinks, to the various professions and occupations. "Why should we not ascertain the grade of intelligence necessary in every essential occupation and then entrust that work only to those people who have the necessary intelligence? This would not be at all difficult to do. It would in some cases require considerable labor, but that is all. For example, how much intelligence does it require to be a Motorman on a street car? To ascertain this, it is only necessary to give mental tests to all the motormen, and then ascertain from employers which ones are highly successful, which ones moderately successful, and which prove to be failures.

It would then be discovered that men of a certain mental level fail, men of another mental level are fairly successful, men of still a third mental level are highly successful and efficient."

To carry the principle further, "society not only has a right to protect itself but it seems clear that society has a right to take any action necessary to attain the highest social efficiency. If this is true, why should we not ascertain the mental level of people in various activities and when we find any inefficient, clearly on account of their lack of intelligence or other qualities, why should not society have the right to transfer that individual to some other line of work where he would be more efficient? This may be too advanced step to be taken at once but it will surely come to that eventually. Such a procedure would work no hardship on the individual because in the long run it would actually increase his happiness and lengthen his life, for there is nothing more deadening and discouraging than to be compelled to work at something where one is conscious that he is inefficient. Many a person is inefficient because of an uncongenial environment which a better intelligence would prompt him to change. Moreover, this emotional condition has a physical basis which, while sometimes beyond control, is nevertheless in many cases capable of being much modified by the use of sufficient intelligence."

Dr. Goddard then goes on to deal with the problem of the delinquents, proper treatment of whom would largely reduce crime and immorality, with an accompanying lessening of the expense of government.

In stating clearly—even baldly—the doctrine of mental levels and pushing its application to a logical conclusion, Dr. Goddard has done a real service to biology. The easy readability of the book—in spite of defects of style—will appeal to non-technical readers, who will find in it food for many thoughts. One need not agree with all the author's statements, to agree with him that the recognition of the innate and inalterable differences among human beings is fundamental to social progress. This will eventually make it possible "for the intelligent to understand the mental levels of the unintelligent, or those of low intelligence, and to so organize the work of the world that every man is doing such work and bearing such responsibility as his mental level warrants."

The Experience of a Clinical Psychologist

MENTAL HYGIENE, two years' experience of a clinical psychologist. By Lillien J. Martin, Ph. D., Pp. 89, Price $1.40. Baltimore, Warwick and York, 1920.

Clinical work in mental hygiene is a relatively new development, that has attracted much public interest. Dr. Martin in this little book tells just how it is done. Her frank and detailed exposition is presumably intended for other psychologists who may wish to work up a "practice"; but it will be equally valuable and intensely interesting to laymen who seek information about this young and important field of science. Any intelligent adult could read this book with pleasure and profit. P. P.

A LIVING DOUBLE-HEADED CALF

WILLIAM M. GOLDSMITH, PH.D.,
Southwestern College, Winfield, Kansas

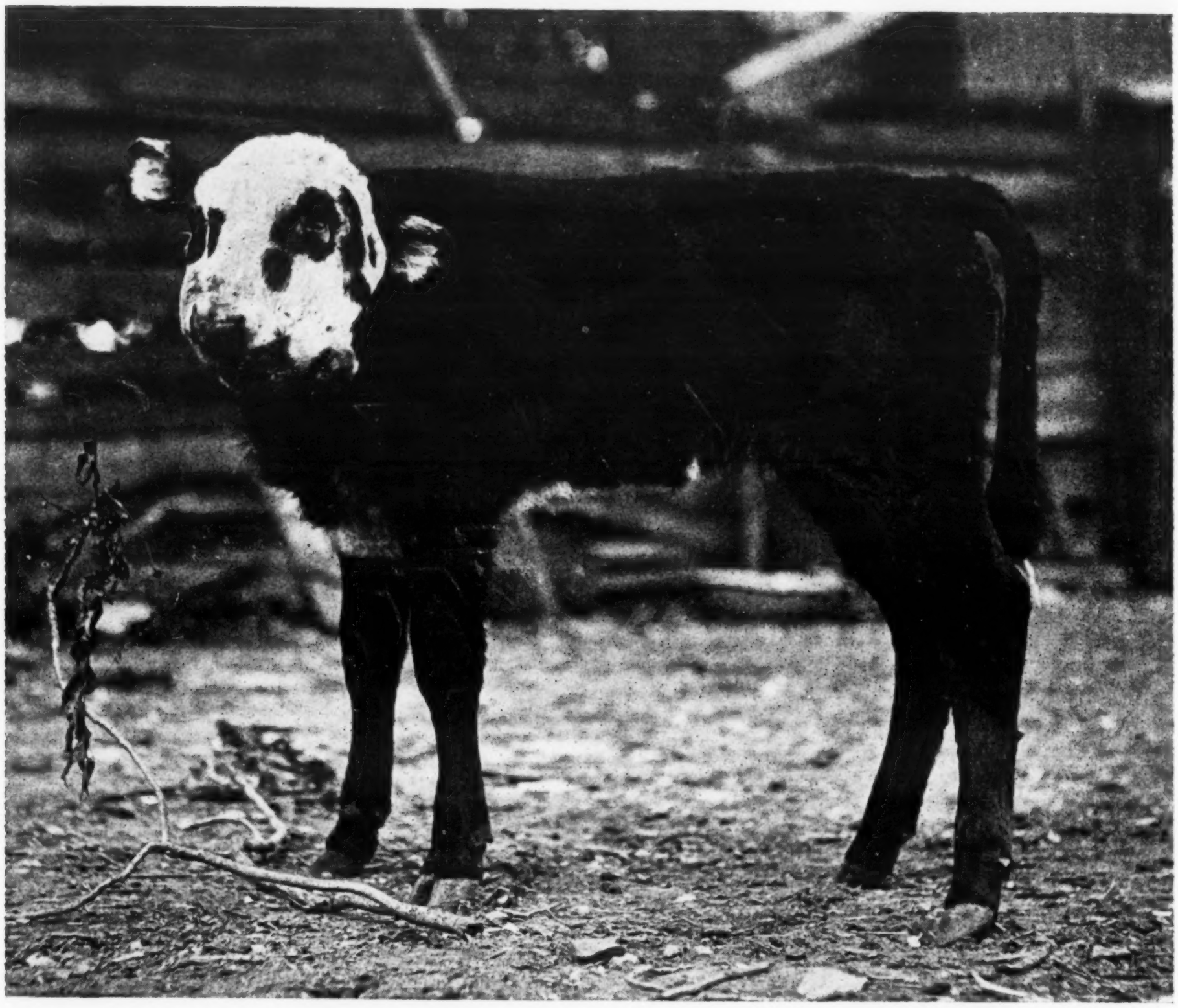
ON MARCH 12, 1921 a grade cow belonging to Edd Ellis, Arkansas City, Kansas, gave birth to a living female double-headed calf. The calf was sold to E. J. Dewitt, 824 North C. St., Arkansas City, Kansas, and put on exhibition in the various towns of southern Kansas and northern Oklahoma. Although an admission of twenty-five cents was charged to see it, hundreds of people were attracted daily. In view of the fact that this calf is still living (July 10, 1921) and feeding through both mouths, it seems of sufficient interest to warrant a brief description.

The calf is normally active and playful but since the only two eyes which are functional are located far to the outer sides of the double head, it presents an awkward appearance when moving about. It cannot see directly forward and therefore turns the head in such a way as to use one eye at a time. When food is offered the calf, it comes forward in an awkward and hesitating manner and nibbles away with both mouths, finally taking in the food through either opening. Figure 22 shows the calf eating hay with the right mouth, the left mouth holding a few straws picked up in an accidental way. The calf is here standing slightly to the left of the hay making it more convenient to use the right mouth.

The most abnormal behavior of this calf is a staggering movement of the posterior part of the body. This is more noticeable when it moves about slowly after being disturbed from a rest. The neck, limbs, and body are well built with no abnormal features. The posterior part of the head articulates with the cervical vertebrae in the usual manner. Since the head is almost flat on top and broadens out to its maximum size near the eyes, the top of the skull presents the appearance of a half-hexagon. The forehead is very full above the division line of the two faces. The nose, upper lips, and nostrils are normal in both heads.

THE MEDIAN DOUBLE EYE

The bivalent nature of the head first expresses itself in the large median double eye socket (Fig. 22). On either side and below the double eye, there are two complete faces connected by a bony bridge to within three inches of the nostrils. The connecting bridge is slightly convex, leaving a depression between the median line and either head (Fig. 22). The two superciliary ridges are normal except directly above the median double-eye socket where they fuse in an abnormal way. The ossification below the double-eye continued until a triangular bony socket was formed. The growth of the skin above the double-eye corresponded with that of the bones. The two upper eye-lids are quite complete, fusing at the top in such a way that the normal lashes from either side cross each other in the upper angle of the double-eye. These upper eye-lids appear quite normal but exhibit no movement. The growth of the skin below the double-eye was so abnormal that no lower eye-lids were formed. Under the eye, the skin has grown up higher in the center than at the lower angles, thus giving the median eye the form of an inverted V. The V-shaped median-eye-socket contains two eyeballs, the inner surfaces of which are in contact. These eyeballs seem to be in a state of atrophy. During the first two weeks of the calf's life they seemed fairly normal. Later they began to turn white until now they are covered with a scaly layer. Each of these eye-balls has an independent movement, indicating that there are two sets of functional muscles.



A LIVING DOUBLE-HEADED CALF

This calf was born in Kansas on March 12, 1921. A remarkable fact is that it has lived and functions sufficiently to sustain apparent normal life. The double head is its only abnormal feature. It is able to eat through either of the two mouths, but only two eyes are useful, and these are situated on the outer sides of the double head. Thus it cannot see directly forward without turning the head sideways, and this causes very awkward movements in walking. (Fig. 21.)

TRIVALENT LOWER JAW

The division of the ventral part of the head is less complete than is that of the dorsal. The lower lips are divided as are the upper lips, but the jaws are fused and crowded and, in general, very abnormal. This fused condition is so marked that the entire compound lower jaw moves in unison. The right side is much nearer normal than the left. The lower incisors, for example, are straight and in a normal position except those on the left side, which are quite irregular owing to the crowded condition at the median fusion line.

The left lower jaw, however, shows signs of further division. There are parts of two sets of incisors. The most interesting feature in this connection is the fact that the two incomplete lower jaws on the left side are not closely articulated but have a slightly independent movement. When the calf chews, the jaw of the right head and the right jaw of the left head move solidly together since they were fused by ossification, while the incomplete jaw on the left side of the left head has a slightly independent action. This, however, is not great enough to interfere with mastication on that side.

The muscular partition between the two mouths is complete but there are no indications of a division between the two rudimentary jaws of the left side.

THE UPPER JAWS AND MOUTH

The upper jaw-bones of each mouth seem quite normal except for the absence of the front teeth. The molars in both mouths articulate in the usual manner. The median double set, however, are crowded against the median muscular partition. The partition protrudes slightly out of the mouth (see Fig. 23) and is characterized by its numerous papillae, many of which are fully one-fourth of an inch long (Fig. 23). Both tongues are normal in appearance except that they are attached more to the median partition than to the outer sides. This gives them an awkward inward movement. The two tongues and the fused jaws have a unified movement. The movements of the parts of the mouth containing no food is identical (except for the slightly loose third jaw) with those of the one feeding. In fact, the two muscles of the tongues seem to converge to a median region.

Although the four nostrils (Fig. 23) are normal, the internal structures surrounding the respiratory passages are very irregular. The most noticeable abnormality in this region is the unusually large cleft in the upper palate of the right mouth, while on the left side the palate is over-developed, almost closing the air passage.

Since it was not possible to study the internal structure of the throat and neck, further analysis was impossible. It would be exceedingly interesting to make a minute anatomical study of the specimen under consideration so that a comparison could be made with somewhat similar abnormalities which have been described.[1]

[1] Albert M. Reese, "The Anatomy of a Two-headed Lamb" Anat. Rec. V. 13, No. 4.

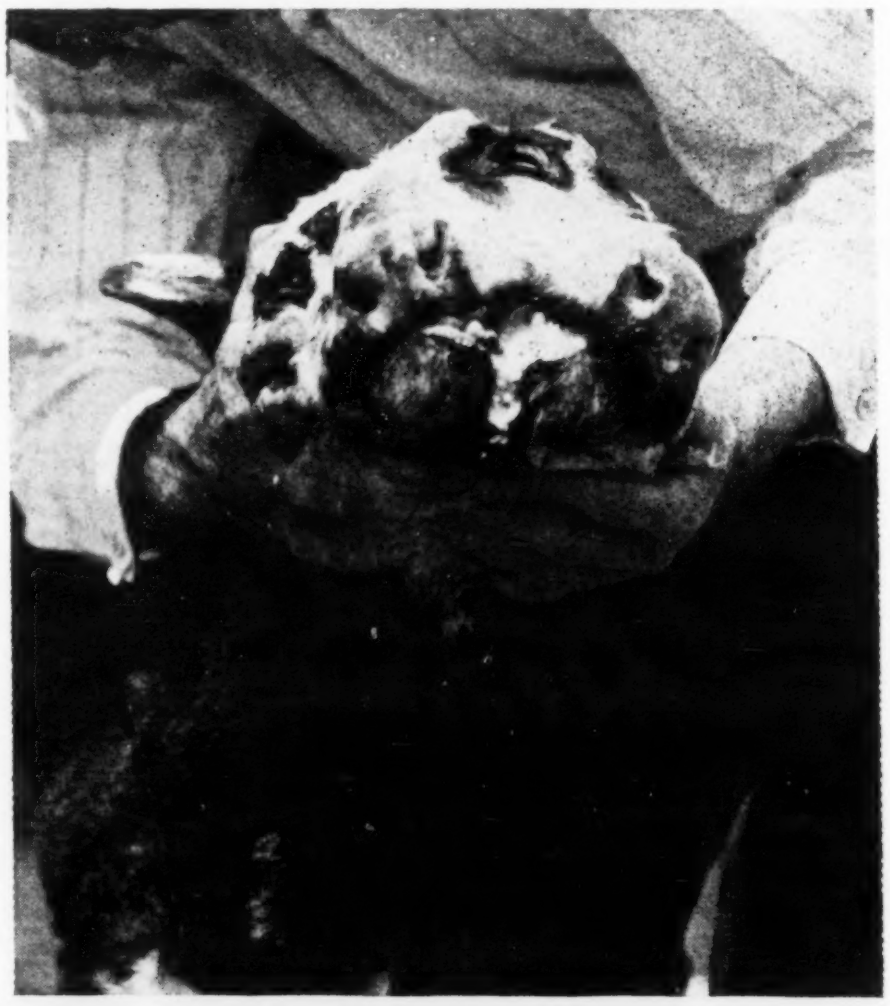
"The Anatomy of a Double-Cat" Anat. Rec. V. 5, No. 8.

Williams and Ranch, "Anatomy of a Double-pig" Anat. Rec. V. 13, No. 5.

E. Carey, "Anatomy of a Double-Pig," Anat. Record, Vol. 12, No. 1.

EATING THROUGH TWO MOUTHS

The calf is shown here eating hay with its right mouth, probably because that side of its head was nearer to the hay. A few straws may be seen in the left mouth. (Fig.) 22.



HOW THE JAWS ARE FUSED (Fig. 23.)

UNCLE SAM'S MODEL VILLAGE

A report on the model health department in the model village which the U. S. Public Health Service has been developing for nearly two years on the 516-acre Government reservation at Perryville, Md., shows some interesting facts.

The reservation was used during the war as a site for a huge nitrate plant. The buildings included 200 cottages, two general stores, a model school house, club, firehouse, and theater for the employes. The whole reservation was turned over by Congress to the Public Health Service for a hospital site and for the storage of the vast quantities of medical stores required for the U. S. Public Health Service hospitals.

The Public Health Service promptly transformed a group of cottages into one hospital and set to build another, the whole now accommodating 430 patients. Not including the somewhat variable hospital quota the reservation now has a population of 839 persons, about equally male and female, with many children and few aged.

The birth rate on the reservation was 39.33 per thousand, as against 24.39 in the whole State and 28.78 in the county. The death rate was only 3.67, the excess in children being probably about balanced by the deficiency in aged persons. While this low death rate is partly due to the favorable age constitution of the population, much of the credit belongs to the efficient health administration.

Careful work has kept the record of communicable diseases low. Particularly was this the case with diphtheria, of which an outbreak was reported early in the year in the village outside the reservation, across the railroad track, from which many workmen came daily to the plant. The Schick test showed that one third of the children in the school were susceptible to the disease; and all of these were promptly immunized by a new method. Three months later a second test showed that only three still remained susceptible.

During the year 30 cases of diphtheria occurred in the county and three on the reservation, one of them a new comer, one a young sister of a boy who was found to be a carrier, and one an adult.

The low prevalence of contagious disease is ascribed directly to close watch and prompt isolation, laboratory diagnosis, and prophylaxis; and indirectly to pasteurized milk, filtered and chlorinated water, school medical supervision and good living conditions, including sewers, screens, and covered garbage cans.

A physical examination of the children showed that 93.5 per cent had physical defects of teeth, tonsils, adenoids, eyes or hearing, this large percentage probably being due to the lack of facilities for remedial correction nearer than Baltimore. Similar percentages are found in the county outside the reservation. Many of these defects have recently been corrected by the parents.

Between November 1919 and 1920 the percentage of underweight children was reduced from 42.7 to 13.8.

Mosquitoes were practically exterminated by the usual methods. This was essential, both to afford much needed relief, and to prevent malaria.

The reservation offers many facilities for research work, particularly in various phases of sanitary engineering. Its location suggests it as a school where public health administration can be taught practically to all interested.